JOURNAL

OF THE

ASIATIC SOCIETY.

No. II. 1856.

Report upon the Progress of the Magnetic Survey of India and of the researches connected with it in the Himalaya Mountains, from April to October, 1855.—*By* ADOLPHE SCHLAGINTWEIT *and* ROBERT SCHLAGINTWEIT.

To Captain ATKINSON,

Officiating Secretary to the Government of India,

Military Department.

SIR,

1. We have the honor to lay before Government a Report upon the progress of our researches in the Himalaya mountains during the last season; we also beg to subjoin a short account of our journey in Thibet, which may be considered as an Appendix to the Scientific Report. We should feel much obliged if Government would do us the favor to communicate the Reports, &c., to the Asiatic Society of Calcutta, for publication.

2. We beg further to communicate to you for the information of Government, that, having completed, for this season, our researches in the Himalayas and Gurhwal, we left the Himalayas on the 8th of November, after having staid three weeks at Mussoorie, to put in order our books of observation, the maps and drawings, &c. We arrived at Agra on the 20th of November, and we propose leaving on the 28th or 29th instant.

In conformity with the plans sanctioned by the Honorable Court of Directors, we propose to go down, during the present cold season, to Subulpore, Nagpore, and if possible south of it into the Madras Territory, to examine the Physical Geography and Geology of the interesting Mountain systems of Central India.

We have the honor to be, &c.

(Signed) Adolphe Schlagintweit.

„ Robert Schlagintweit.

Agra, November 24th, 1855.

GENERAL OUTLINE OF THE ROUTE.

We left Calcutta on the 25th of March, and went by Raneegunge and Gya to Patna. It was originally intended that we should carry on our researches during the summer in the Himalayas of Nepal. But being informed at Patna, by the Resident, Major Ramsay, of the difficulties which we should find in Nepal, and of the great reluctance of the Nepalese Government to grant us permission to go to any distance from Kathmandu, we thought that the object of our scientific researches would be better advanced by our going during this season further westward to the British Provinces of Kumaon and Gurhwal.

We proceeded therefore, in accordance with verbal instructions received beforehand in Calcutta, one of us (Adolphe) by Ghazeepore, the other (Robert) along the Grand Trunk Road to Benares. After staying two days at Benares (from the 5th to the 7th of April) in order to make a set of magnetic observations, we went up, by Allahabad, Futtehghur and Bareilly to Nynee Tal, in Kumaon, where we arrived on the 15th of April, having been engaged during our journey chiefly with Geological and Meteorological observations. We remained at Nynee Tal and its environs till the 15th and 20th May. We stayed several days at Chunar and at Heriakanta, two isolated mountains in the neighbourhood, which gave us a very good opportunity of making several physical and topographical observations. One of us, (Robert) left Nynee Tal on the 15th of May, taking the route by Almora, Bagesur and Momespanee to Milum, the highest village in Johar; the other (Adolphe) went on the 20th

of May to Pindaree and over the Pindaree or Trail's Pass (17,950 E. F. high) to Milum, crossing at the Pass the high snowy range of Trisoal and Nanda Devi.

During the month of June, we were both of us engaged at Milum, and at several elevated places and glaciers at some distance from it, with a series of Physical and Geological observations. We left Milum on the 6th of July and went by the Uta Dhura (17,670 E. F. high) and Kyangur (17,300 E. F.) Passes into the Thibetan Province of Gwarikhorsum; all the baggage which was not absolutely wanted being sent round by Hoti and Niti to Badrinath. After many negociations with the Lhassa Officials forming the Government of these parts of Thibet, we made it possible to go as far as the Sutlej, and afterwards as far as the Chako La Pass (17,350 E. F. high) which lies in the range separating the Sutlej from the Indus, where we arrived on the 25th of July.

We succeeded in reaching from thence, between the 26th and 28th, the valley of the Upper Indus, near Gartok, which had only once before been visited by Europeans, i. e. in 1812, by Moorcroft and Hearsay.

From two stations, one near the Indus, the other at a fine isolated peak, Gunshankoerr, (29th July, 19,640 E. F. high) not far from Chako La, we had an opportunity of taking several series of angles with a Theodolite, which will serve to lay down the Mountain systems round the origin of the Indus and North of it.

From Chako La we proceeded by Gyungal, Daba and Mangnang to the foot of the great glacier stretching out to the northward into Thibet from the high peak Ibi Gamin (called also Kametinrite), where we arrived on the 13th of August.

After having explained the merely scientific nature of our researches and made the necessary arrangements, we met with no further trouble in any way, and enjoyed throughout our journey quite a friendly intercourse with the inhabitants.

We started from this point on the 16th of August, to examine the structure and dimensions of the Ibi Gamin glaciers, with the intention also of attempting to ascend as high as possible on the flanks of the Ibi Gamin.

After encamping on the 18th of August on the highest Moraine of the Ibi Gamin glacier, at an elevation of 19,220 E. F. we succeeded, on the 19th of August, in ascending on the Northern flanks of Ibi Gamin, covered with deep snow, to a height of more than 22,200 E. F. (22,260 E. F.) calculated from Agra.

The very difficult ground, and a strong North wind, made it impossible to advance any higher on the flanks of the Ibi Gamin, whose summit is about 25,500 E. F., according to Captain R. Strachey.

We had an opportunity, during this ascent, of making several observations on the temperature, the hygrometric conditions, and the transparency and blueness of the atmosphere, and of examining on a large scale the Geological and Orographical structure of the great group of the Ibi Gamin Mountains. We may be permitted to remark, that, as far as we know, it is the grestest height in any Mountain system at which, till now, any observations of a similar kind have been made.

Encamping the next three days on different parts of the Ibi Gamin glaciers, between 17,800 to 19,000 E. F., we crossed, on the 22nd of August, a high glacier pass, leading from the Western branch of the Ibi Gamin glaciers, along the Sursutti glacier, down to the valley above Mana and Badrinath.

This pass (20,430 E. F.) is certainly one of the highest in the Himalayas; it has only once been crossed, by people from Mana, some 30 or 40 years ago.

We arrived at the village of Mana, above Badrinath, on the 24th of August. From Mana, we took two different routes, one of us, (Adolphe,) left on the 2nd September and went again into Thibet by the Mana Pass (18,365 E. F. high) for the special purpose of completing the Geological investigations on the composition of the sedimentary fossiliferous strata on the North side of the Himalayas.

He succeeded in crossing the Sutlej a second time near Toling, and, accompanied by a few mounted men, reached on the 9th of September, without being in any way molested, the high pass of Phoko La (18,700 E. F. high) lying in the ridge which separates the Sutlej from the Indus, North-West of our former station, Chako La.

He took a series of angles from this place, and went back to Toling, Tsaprang, and from thence to the village of Puling.

On the 19th of September, he returned by the Nelong Pass (18,110 E. F.) from Thibet into the Himalayas properly so called, arriving at Nelong on the upper branch of the Bhagarutti, or Western Ganges, on the 24th of September, and reaching the village Mukba, a little beyond Gangotri, on the 27th of September.

A high pass, (3rd October 17,610 E. F.) leading from Mukba to the origin of the Tonse River, offered a good opportunity for examining the very remarkable Geological structure of the high groups of the Jumnotri and Dundar peaks.

From the Tonse, he went up to Kedar Kanta (12,630 E. F.,) an isolated Mountain, commanding a very extensive view, and after staying there two days (12th and 13th of October), went down along the Jumna valley to Mussoorie, which he reached on the 18th of October.

The second of us, Robert, left Badrinath on the 7th of September, having been engaged for some days with Photographical experiments.

He went down by Tosheemath and Okimath to Kedarnath Temple, where he employed three days, (21st to 23rd September,) in examining the structure of the Kedarnath glacier and the Topography of the Mountain system between Kedarnath and Gangotri. Sending round the baggage by the ordinary road, he himself crossed over a series of passes from 11 to 12,000 feet to Salung, on the Bhagarutti River, where he arrived on the 3rd of October. These passes offered a good opportunity for the determination of the limits of vegetation in the central parts of the Himalaya for comparison with similar observations which had been previously made on the higher passes leading out to Thibet.

From the Bhagarutti he crossed over the Chaia and Bainsura Passes (15,280 E. F.) to Jumnotri, and there examined the remarkable hot-springs; the temperature of the warmest is 89° centigrade, being nearly equal to the temperature of boiling distilled water at this place (90.50° cent). He filled here, as well as at the hot springs of Badrinath, Gaurikund, Uri and Banassa, a considerable number of fine glass bottles with water, and we hope that the chemical analysis of these waters may not prove without some interest hereafter. He went down along the Jumna River to Mussoorie, where he arrived on the 21st of October.

We beg finally to state the great obligations we are under to Mr. Batten, the Commissioner, and to Captain Ramsay, the Assistant Commissioner, of Kumaon, who did every thing in their power to assist the progress of our researches in the Himalayas, and who kindly procured for us every where the men best able to give us all the necessary information about the country.

Physical Geography and Meteorology.—Magnetic Observations.

1st.—Complete Magnetic Stations have been made at—

1. Benares.
2. Nynee Tal.
3. Milum in Johar.
4. On the Sutlej near its confluence with the Gyungal River, where only the Magnetic Dip and Declination could be determined.
5. Mana in Gurhwal above Badrinath.
6. Nelong (declination only).
7. Ussila, near the origin of the Tonse River.
8. Mussoorie.

We may be excused for not entering at present into any detail of the result of the Magnetic observations themselves, since we are anxious, before giving the general results of these observations, to compare our data with the corresponding observations made by our brother, Hermann Schlagintweit, in the Himalayas of Sikkim, in the Khasia Hills, and in Assam.

The necessary calculations and reductions will, however, be completed in a short time, and we shall have the honor to submit to Government, as soon as practicable a full comparative account of the whole of these observations.

Barometric and Hypsometric observations.

2ud. We have been able to make during the whole of our journey continuous observations of the Barometer and of our delicate Hypsometers or boiling point Thermometers.

Our two Hypsometers have arrived quite safely at Mussoorie. Of the Barometers which are very difficult to carry during a long time over a mountainous country, one by Adie, of London, arrived in perfectly

good order in Mussoorie. In two others, some air introduced itself; they will however, be easily boiled and put again in perfect order, in Lieut.-Colonel Waugh's office at Dehra. Two small Mountain Barometers, by Newman, with which Captain Thuillier kindly supplied us at Calcutta, were of great use to us whilst going up along the Ganges to Nynee Tal, enabling us constantly to make comparative observations with the help of our assistants, but we found that their construction was not well adapted for travelling in the Himalayas, where a considerable quantity of air soon introduced itself into the tubes.

3rd. We have determined the elevations above the sea of from 350 to 400 places, and have endeavoured as much as possible to obtain for each place not only one, but several readings of the instruments at different hours. At some stations like Nynee Tal, Chineir Peak, Laria, Kanta, Milum, Tanti Pass, the Sutlej near Gyungal, Mangnang, Mana, Kedar Kanta and Mussoorie, we have obtained a regular series of Barometric observations during several days or several weeks, we ourselves or our assistants reading the instruments hourly, or at intervals of two hours.

We may be excused for not subjoining to this Report any larger list of heights, since it would take a very considerable time to make the necessary calculations with all the accuracy and the detail which is required for exact and final results, and the great distances over which we shall have to go to complete the observations made last year, make it impossible for us to stop a long time in one place. In reference to the heights quoted in this report, we wish to state that they have been calculated from corresponding observations made at Agra and at Bareilly. The observations at Agra were made with great care in the Office of W. Muir, Esquire, Secretary to the Government of N. W. P., for those at Bareilly we are indebted to the scientific zeal of Dr. Payne. Mr. Muir obligingly transmitted to us regularly the monthly registers.

The heights thus deduced must not be considered as quite final results, since at a later period, when we have an opportunity of calculating the whole of our heights from several corresponding stations, and introduce certain corrections in reference to the exact mean temperature of the air between the higher and the lower

stations (deduced from simultaneous observations at intermediate places), our present results may be altered in some degree.

Temperature of the air and of the ground.

4th. The Meteorological observations of the dry and wet bulb Thermometer, of the temperature of the ground from the surface to a depth of five or six meters, of the temperature of rivers, &c. have been regularly made in connection with the Barometric observations; a regular series of observations being made at all the stations where we halted for some time. We found that the moisture of the atmosphere considerably decreased as we advanced from the southern branches of the Himalayas northwards to the high valleys. In Thibet, the dryness of the atmosphere was constantly very great. It is also worth remark that in Thibet, during the warmest months of the year, in July and August, the temperature of the air is sometimes very warm, rising in the shade at elevations of 13,000 and 14,000 E. F. to from 22° to 25° (centigrade). The temperature of the surface of the ground exposed to the sun rises to 45° centigrade.

The *variations* of temperature are, at the same time, very great, and sudden clouds, which prevent for a time the heating of the soil by the sun, produce, after a short time, a great decrease in the temperature of the air, amounting to 10° and 12° cent. Passing clouds, sending down suddenly a light fall of rain, or more often of fine-grained snow, are also of very common occurrence, both in the Sutlej valley and on the Passes.

5th. The rainy season extends, though with much diminished force, up to the highest valleys along the southern water-shed of the Himalayas. It begins later and ends earlier than in the outer ranges, and on many days the threatening clouds travel up from the southward to the higher valleys, without producing any sensible fall of rain. The rainy season cannot be said to extend properly speaking across the Himalayas into the basin of the Sutlej. The regular succession of the dry and rainy seasons of India is unknown there, and, from very good information which we obtained, there is no month of the year which can be considered free from rain. But nevertheless the *influence* of the Indian rainy season is still felt in

Thibet. During the time of heavy rain-falls on the southern side of the Himalayas, we very often saw for several days together masses of clouds, which came from the south, hanging over the Sutlej plain. They occasionally produced rains, which fell in great quantities, but never lasted an entire day.

6th. The *winds* in the Himalayas and in Thibet during the summer months, are generally of great regularity, blowing up constantly nearly every day from the South, South-West or South-East.

(*a.*) In the upper Himalaya valleys, the wind generally sets in at from 9 hours to 10 hours A. M., its strength increasing considerably towards the evening.

(*b.*) The intensity of the wind seems to be greatest on the passes leading from Thibet into the Himalayas elevated from 17,000 to 19,000 E. F. where we experienced sometimes in the afternoon a most furious Southerly gale. In going from thence to the Southward, the intensity of the wind decreases in a very striking way, and on Kedar Kanta, and on the stations in the outer Himalayan ranges, the intensity of the wind is, comparatively speaking, very slight. This increase in the intensity of the wind on the high northern passes seems to be due to two causes—the first of them is, that the wind may in part originate in the hot valleys of the Southern Himalayas themselves; the second, and we presume the more important cause, will be that the wind produced by the great ascending current over the heated Indian plains is fast travelling Northward at a very great elevation, and only sinks down when it reaches the colder and higher chains of the central Himalayas.

In support of the latter view, we may mention that we often saw very high clouds above us moving at a great rate, whilst the wind at our own elevation had a much smaller velocity.

7th. Our observations of the temperature of *springs* and of the *ground* at various depths have shown—

(*a.*) That the temperature of springs and the temperature of the ground at depths varying from one to three meters, is, at *equal* heights, considerably higher in Thibet than in the Himalayas; the cause of this will be that, in Thibet, we have a plateau whose mean elevation is from 14,500 to 16,000 E. F., whilst the Himalayas, at

the same height, offer only a series of ridges, intersected in all directions by large and deep valleys.

(*b.*) The height at which the temperature of the ground is 0° cent. or 32° Fahr. seems to be along the passes which lead from the Himalayas, into Thibet, about 17,000 F. F., at this height we several times found the temperature of the ground at a depth of 2 or 3 meters to be 0° cent., and some good springs a little lower showed temperatures of only 0.2° and 0.5° cent.

8th. In the outer ranges of the Himalayas, and in the valleys between them, at elevations of about 4,000 E. F., the temperature of good springs on an average may be assumed at 18° cent., the decrease of temperature from this height to the line of zero would therefore be one degree cent. for an ascent of about 720 E. F. It seems pretty certain that the decrease of the temperature of the ground and of the springs from the foot of the Himalayas up to the line of zero is more rapid than in the Alps of Europe, where we formerly found 700 or 730 French feet for a decrease of temperature of one degree cent.

9th. We endeavoured as often as possible throughout the journey to determine the height of *the different lines of vegetation*, the height of the snow line, &c., by aid of our barometers. We found, as a general rule, that the limits of shrub vegetation, of grass, and phanerogamic plants, rise considerably higher on the Thibetan Mountains than in the Himalayas. We found that some very isolated phanerogamic plants ascend generally speaking, in these two Mountain ranges to heights of 17,800 to 18,400 E. F.; the maximum of height, to which we saw some very few phanerogamic plants rising, was on a sunny rocky island, between the snow masses of the Ibi Gamin glacier, at an elevation of 19,800 E. F., which, if we are not mistaken, is the *greatest height* at which till now phanerogamic plants have any where been found. The line of the lower limit of snow without doubt rises higher on the Northern Thibetan side of the Himalayas than on the Southern India face of the mountains, as Humboldt maintained a long time ago.

In reference to the periodical development of vegetation, which forms an interesting element in considering the Physical Geography of a country, we may mention, amongst other results, that in Thibet,

in valleys of 12,500 to 14,000 E. F. elevation, the ripening of grain (a sort of wheat) takes place at a considerably earlier period than in the valleys of the Himalayas which are situated only at heights of from 10,000 to 11,500 E. F.; the principal cause of this appears to be that, in the higher Himalayan Mountains, the great amount of snow retards vegetation in the spring, and tends after melting to cool down the temperature of the surface of the ground for some considerable time, whilst in Thibet the fall of snow in winter is never large, and, as we have been informed, it constantly melts away again some days after its fall.

Influence of height upon Man.

10th. The influence of height upon the constitution of man varies exceedingly in different individuals. It depends much on the physical strength, and the acclimatization of a few days at great elevations certainly tends very considerably to diminish its effects; but there is no doubt that this influence exists; it generally produces more or less severe headache, and difficulty of respiration, and in some instances we saw that some of our people were spitting blood; complaints of the eyes too are of frequent occurrence, produced in part by the bright light of the snow, in part by heavy winds which blow small dust into the eyes. It certainly is difficult to ascertain how much is due in these phenomena to the diminished pressure of the atmosphere, and how much to the great bodily exertion.

We had occasion ourselves to test the great effect of acclimatization; when for the first time we crossed heights of 17,500 and 18,000 E. F. we felt more or less headache, but after having crossed several others of these passes, and slept and lived on them for some days, we found ourselves quite free from any complaints at heights of 18,000 and 19,000 E. F., when, however, we ascended Ibi Gamin to a height of more than 22,000 E. F. neither we nor any one of our people escaped headache, difficulty of breathing and severe pains in the eyes.

Geography and Geology.

11th. We had with us two Theodolites, a large one minutely divided by Pistor, at Berlin, and a smaller one by Jones, which have remained in perfect order during the whole of the journey.

We made great use of them in the parts of the Himalayas North of the Snowy Range and in Thibet, and we endeavoured, by taking a series of angles from several elevated stations, to furnish materials for ascertaining the position and height of the ranges between the Sutlej and North of the Indus; the principal stations were near Milum and on the Milum Glaciers, the Sutlej near Gyungal, the Indus near Gurtok, Gunshankoerr (19,640 E. F.), on the Ibi Gamin Glacier (19,220 E. F.), on the Mana Pass (18,365 E. F.), Chako La (17,350 E. F.), and Phoko La (18,700 E. F.), the Nelong Pass 18,110 E. F.), &c.

We hope that our observations, combined with the excellent researches formerly made at other points by Captains Henry and Richard Strachey, may serve to give a pretty correct general view of the interesting geography of the large basin of the Sutlej.

11th. Our topographical maps refer more especially to the different glacier systems in the central groups of the Himalayas, several of these maps will be found in the book of drawings, &c., which we have the honor to submit to Government for inspection, together with this Report.

We think it essential to state that these maps, as they are at present, being mere *topographical* sketches made during the journey and on the ground, have, comparatively speaking, only small parts of our bearings and angles protracted upon them. They will all require revision and correction, after the final computations of our angles; we hope therefore, that these maps may not be used for publication, till we have had the opportunity of making all the necessary revisions as accurate as possible.

We must content ourselves with enumerating in a few paragraphs some of the results to which we think the geological investigation of this part of the Himalayas must lead us.

12th. The extent of the real crystalline rocks, as granite, gneiss, and true mica schists, is, comparatively speaking, much smaller in the Himalayas than has been sometimes assumed. They are strictly limited to the high central groups of this mountain system.

These groups seem to form, from a distance, one *continuous* line of high peaks, covered with snow, generally known under the name of the *Snowy Range;* but in reality, it is by no means a continuous

chain of mountains, but a succession of *several* groups *separated* very often by deep valeys.

These groups do not even follow each other from East to West on one and the same line; but some of them, as, for instance, the group of Nanda Devi and Trisoal, lie very much to the South, while the next great group, that of Ibi Gamin, lies thirty or forty miles more to the Northward. There are also instances of several central groups, or at least several nearly quite independent parts of one system, lying behind each other, in making a section from South to North, so that you have in going straight to cross a series of snowy ranges.

The best examples of the latter structure with which we are acquainted at present, are the high groups of Bunderpunch and Shergeroin near Jumnotri, with the high Dundar peaks North of them, and the high mountains to the North and South of the Baspa valley in Bisser.

This arrangement of the central Himalayan groups reminded us very much of the structure of the Alps.

Altogether, indeed these central groups of the Himalayas have much resemblance to the highest parts of the European Alps, both in reference to the distribution and general form of the valleys filled with numerous glaciers, as well as with regard to the forms of mountain peaks and the character of vegetation.

But these are nearly the only parts of the Himalayas which can be compared with the Alps, the geological structure of all the rest is extremely different.

The *prevailing* rock of most of the Himalayan groups is gneiss, *passing* into mica schist. It was only in some of them, as in the Gangotri and Jumnotri groups, that we met with large and predominant masses of true granite; in some places this granite passed into the remarkable rock *protogine*, or talc granite, which composes the Mont Blanc group in the Alps.

We felt considerable interest in investigating whether the "fanlike" structure which prevails in many groups of the Alps, was also to be found in the Himalayas.* As far as we have ascertained at

* By "fanlike structure" is understood the curious phenomenon first discovered in the Alps by Saussure, that in several instances the strata or planes of foliation

present, it seems that this structure cannot be considered as very general in the Himalayas. We only found one clear example of it in the Jumnotri and Bussa group.

There we see the gray slates constantly dipping *under* the granite, which overlies them in thick masses, forming the high peaks of Bunderpanch, Shergeroin, &c.

13th. The Feldspathic crystalline rocks of the centre, are accompanied by large masses of grey schists, which are especially developed along the Southern side of the central groups; to the Northward of them they often form only a very small band, passing into stratified azoic slates. These schists can by no means be considered as a real crystalline rock.

As in the Alps, they are of a very irregular and varied composition; they are generally of a greyish colour, and contain large quantities of clay and more or less lime. The quartz is generally not present in regular small grains, but either disseminated throughout the rock or entirely absent. The mica is generally present in exceedingly small laminæ. Sometimes considerable quantities of limestone are found between the schists.

These grey schists extend very nearly from the central groups down to the Southern edge of the Himalayan mountains. There they pass very often into clay slates of a more sedimentary character.

We have not been able to discover any fossil remains in the grey schists *themselves,* but in the clay slates into which they graduate to the Southward, we found, in the neighbourhood of Nynee Tal, numerous Foraminifera, evidently identical with those which accompany the eocene numulitic formation; our observations during next year must teach us, whether we shall be justified in drawing a general conclusion from this fact, as to the age of the outer ranges of the Himalaya composed of similar clay slates.

14th. It was observed a long time ago, that in the great mass of grey schists which must be traversed before reaching the central group of the Himalayas, a remarkable uniformity in the dip of

of the gneiss dip from both sides *under* the highest part in the centre, where they stand vertical, so that by drawing a geological section we get a somewhat fan-like form.

apparent stratification prevails. Our observations have perfectly convinced us that this is no real stratification, but merely *cleavage*, produced, as is now generally assumed, by a great tension in the interior of the highly altered rocks.

The general dip of the cleavage planes is in a Northerly direction, deviating in some parts of the mountains to the North-west, and in others to the North-east; and it seems that *in many cases at least the cleavage of the central gneiss masses dips in the same direction* North North-east, or North North-west.

If, after crossing the central groups we continue a geological section into Thibet, we observe that, in the sedimentary fossiliferous strata which are then met with, there occur, independently of each other—(*a*) a true stratification and (*b*) a cleavage, which dips in the same direction, like the cleavage of the crystalline rocks which underlie the sedimentary strata.

15th. This very general Northerly dip of the cleavage continues in the sedimentary formations until we reach the alluvial plain of the Sutlej valley. But it is a fact well worthy of remark, that a perfect change in the dip of the cleavage takes place in the mountain ranges which rise between the Sutlej and the Indus, and to the North-east of the Indus.

We had occasion to examine these mountains along two sections over the Chako La and Phoko La Passes, distant more than 20 miles from each other, in a North-westerly direction. The mountains are composed of various metamorphic schists, intersected with greenstone dykes, running on an average parallel with the mean direction of the chain.

In these mountains, as well as in the similar rocks brought to light by the great denudation of the Sutlej river, we *constantly* found the cleavage dipping under angles of 45° to 70° to the *South* or *South-west*.

This dip is exactly opposite to the dip of the cleavage in the Himalayas.

It therefore seems that, taking a general view, the cleavage in the Himalayas of Kumaon, and in the mountain ranges which face the Himalaya to the Northward, forms one great fan, of enormous dimensions, the cleavage dipping in the Southern part of this fan to the

Northward, and in the Northern part to the Southward. It is only with some hesitation that we venture to bring forward this opinion. Our observations during next summer in a part of the Western Himalayas, and of Ladak, must show whether this structure can be considered a general one or not.

Sedimentary Strata.

16th. In the sedimentary strata, which, as it has long since been ascertained, compose the northern flanks of the Himalayas, we met with—

(1) The silurian and devonian formations, the latter being characterised by the appearance of numerous large and long-winged spirifera; and (2) the trias with several ammonites, closely allied to those which characterise the trias of the Alps, and the Jurassic formations. The latter is divided stratographically into two great groups, the lower one composed of black and bluish slates and marls, containing in many places large numbers of well-preserved ammonites, the upper group consisting of limestones and marly limestones of different colours, which seem not to contain any ammonites, but are very often full of bivalve shells, comprising small and large oysters, pecten, a very characteristic and common species of Astarte, a Trigonia, which we think will not be distinguishable from the wide-spread Trigonia costata, found also, if we recollect rightly, in Cutch, &c.

Amongst the numerous ammonites which we had occasion to collect in the lower group from different localities, we found nothing which would indicate an age as old as the lias.* They all are of forms which characterise, in Germany and England, about the middle part of the jurassic formation. Whether the lias formation exist in these parts or not, is a question which as yet we are not quite prepared to decide.

We have no books at hand to examine as minutely as necessary, some small fossil remains of pentacrinus and terebratula, which we found in such a stratographical position, that they may perhaps belong to this formation.

* The collections made by Captain R. Strachey in 1848, were, we believe, the first which showed clearly that the ammonitic deposits were younger than the lias.

We have been unable to find any traces of a cretaceous or numulitic formation in these parts of the Himalayas, the tertiary strata of the Sutlej basin repose immediately upon the Jurassic formation.

Valley of the Sutlej.

17th.—The alluvial deposits which we meet after traversing the sedimentary strata on the northern flanks of the Himalayas, do not form an elevated plain bordering the Himalayas to the Northward, as the plain of Hindustan does in the Southward; they are merely alluvial and lacustrine deposits, filling up the inequalities of one of the largest longitudinal valleys of the world. On the other side of the Sutlej, and of the Indus, new high mountain ranges rise covered with snow, and very probably bearing glaciers, which evidently belong to the same system of mountains. Looking from a high station like Gunshankoerr peak near the Indus (19,640 E. F.) over the Himalaya mountains to the South, and the long range of mountains to the Northward, the mind is strongly impressed with an idea of the unity of both mountain systems, in reference to orographical and geological structure.

It is evident that the Himalayas form only one incomplete part of the great mountain system of High Asia; the numerous large rivers descending from the Himalayas to the South into India, all run through lateral transverse valleys, which might perhaps be compared with regard to their position in the general mountain system (though of course *not* with regard to magnitude) with the numerous parallel transverse valleys running from the Pennine Alps into the Rhône, or from the Tauern chain in the Tyrol into the Salzach and the Draw.

18th. The tertiary deposits in the basin of the Sutlej are of a fluviatile and lacustrine nature; they have been deposited in a large fresh-water lake, probably formed by a rocky barrier, formerly existing at the place where the Sutlej now penetrates the Himalayas.

We found in them numerous fresh-water shells near Mangnang and Tosing; besides these they contain many remains of vertebrata, we were able ourselves in the neighbourhood of Mangnang to pick out from the rock some of these fossil remains, and ascertained the localities where others which we bought were procured.

The deposits consist in part of gravel and sand, in part of very finely grained clayey and calcareous strata, of a light yellowish colour. They are interstratified with each other; the shells are chiefly found in the marls and clays, which are specially predominant in the central parts of the basin; and at Mangnang, Tosing, &c. the fossil bones are found both in the marls and in some fine grained sands which accompany them.

The strata lay everywhere quite horizontal. The thickness of these deposits is very variable, since the original rocky surface of the valley is very undulating, as is shown in the deep valleys of denudation along all the rivers.

The average thickness may be assumed to be from 1,000 to 1,500 E. F. but the maximum exceeds 3,000 E. F.

19th. The Sutlej and its numerous tributaries in Thibet, form one of the finest examples of the mode in which the erosive power of water acts upon loose deposits and upon solid rocks, under various circumstances. The rivers have excavated valleys of denudation 2,000 and sometimes even 3,000 English feet in depth. These valleys are not excavated in the lacustrine tertiary deposits only, but very generally along the Sutlej, solid rocks are cut through to a depth of 1,000 and 1,500 E. F. This great depth of the valleys of denudation is evidently due to the fact, that the Sutlej afterwards enters the Himalayas where the fall of the river per mile is enormous. The great acceleration experienced there, has been gradually reaching upwards, and has affected the whole river system of the Sutlej basin.

When re-entering the Himalayas, after having examined these great denudation valleys, we proposed to ourselves to investigate the effect produced by the Himalayan rivers, which have such an enormous fall per mile, upon the excavation of their valleys. We soon convinced ourselves that, though the general direction of these valleys was without doubt originally caused by faults, and by the general arrangement of the mountain chains, their forms had afterwards been altered to an immense extent by the action of the rivers, and by the rain falling in enormous quantities during the rainy season. We have ample proofs by the existence of ancient river deposits, and water marks, at great heights above the present rivers, and from

the form of the valleys themselves, that most of the large transverse valleys of the Himalayas have been excavated to a depth of more than 3,000 and 4,000 E. feet by the action of water alone.

20th. We noticed also the absence of true erratic blocks both in the Himalayas and in Thibet, which are so numerous round the Alps of Europe.

Glaciers.

21st. Glaciers sometimes of great extent are found everywhere in the Himalayas round the central groups. They even exist in Thibet, where the fall of snow is so much less, and we have every reason to believe, both from what we saw ourselves, and from the information which we received, that glaciers are again met with in the ranges to the North and North-east of the Indus.

The two largest glaciers which we have been able to examine, are the glacier of Milum and the Ibi Gamin glacier, issuing from Ibi Gamin into Thibet and giving origin to the Manguang river. These two glaciers are certainly larger than any in the Alps, but, as a general rule, we may say, that the glaciers of the Himalayas are not so much larger as we might expect from a consideration of the great extent and elevation of these mountains. One cause of this phenomenon may be, that the high valleys of the Himalaya have, in general, a greater and more precipitous slope than the corresponding valleys in the Alps, so that the ice is carried down too quickly to lower and warmer places; the heavy rains during the warmest part of the year, will also tend to melt away the ice.

22nd.—During the course of our journey, we visited and examined, to some extent, more than 40 glaciers, which, according to the classification in the Alps, must be termed glaciers of the first order. The largest accumulation of great glaciers in the Himalayas of Kumaon, Gurhwal and Bisser, is around the great group of the Ibi Gamin peaks.

The physical structure of the glaciers of the Himalayas, the laws of motion, the distribution of the moraines and of the crevasses, is precisely the same as in the glaciers of the Alps. We could constantly trace also the blue bands of ice, or "ogives" which form such a characteristic physical phenomenon in the Alpine glaciers.

Amongst the results of our observations we may briefly mention two points.

23rd.—We have collected many proofs that, as we formerly maintained, in accordance with Professor T. Forbes' views, the original stratification of the snow which fills the upper part of the glacier basins, is perfectly destroyed during the process of the transformation of the snow and nêves into glacier ice; the blue bands and ogives of the glacier, properly speaking have no connection with the former stratification of the snow.

24th.—At several glaciers, especially at the great Ibi Gamin glacier, we found the curious phenomenon which we formerly described in the Alps, under the name moraines de néve; that is to say, we observed in several instances, that different affluents of one glacier were separated, not by the layers of stones called moraines, but by a small band of néves squeezed in between the two affluents. Lower down in the course of the glacier when the néves disappeared, they remained nevertheless distinctly separated by considerable depression between them; moreover, the individuality of each affluent was proved by a perfectly independent arrangement of the blue bands and ogives. This phenomenon shows well, that the heaps of rocks which generally lie along the line of demarcation between two affluents of a glacier, are quite of a superficial nature, and that the real separation is entirely due to the interior structure of both tributaries.

25th. As a general phenomenon we must finally mention that, on all the glaciers of the Himalayas which we examined, with scarcely one exception, we found most evident proofs that they are at present smaller than they were at some former period. We constantly found heaps of moraines at a distance of from several hundred to some thousand feet, in a few instances even of some English miles, from the present ends of glaciers; the height and thickness of the ice had also been proportionally larger. The Thibetan glaciers afford peculiar facilities for the investigation of these phenomena. Their moraines consist principally of fine gneiss rocks brought down from the higher mountains. The ancient moraines of white gneiss deposited upon dark sedimentary schists, can be very distinctly traced to a distance of from four to five miles from

the present ends of the glaciers of Ibi Gamin, of Joharna, and of Photi, and are elevated some hundred feet above the present level of the ice. This greater extension of the glaciers has evidently belonged to the historical period, since the ancient moraines repose constantly upon all the older tertiary and diluvial strata, and if we are not mistaken a diminution in the extent of *some* of these glaciers is still going on at present.

We wish especially to remark, that this greater extension of the Himalayan glaciers, at some former period, is a phenomenon very different from that which gave rise to what has been called in Europe the "glacier theory," by which an attempt was made to explain, on the hypothesis of a former enormous extension of the Alpine glaciers, the existence of the great erratic deposits all around the Alps, where the erratic blocks are in situations very different from the ancient moraines in the Himalayan glaciers.*

We are not as yet prepared to give an opinion about the physical causes (changes of climate, and general subsidence or elevation,) which may have produced this difference in the extension of the glaciers.

(Signed) Adolphe Schlagintweit.
Robert Schlagintweit.

Agra, November 24th, 1855.

A short account of the Journey from Milum in Johar, to Gartok in the Upper Indus Valley, and of the ascent to the Ibi Gamin Peak, by Adolphe Schlagintweit *and* Robert Schlagintweit.

We left Milum on the 6th of July, with Mani, the Putwarri of Johar, and a good number of Jubboos and people, since we wanted to send all our baggage by the upper road to Niti. After crossing the Uta Dhura Pass, we went up, with a few people only, to the Janti Pass, (18,650 E. F.,) where we staid for three days, which

* That I may not be misunderstood, I must refer here to the remarks on this difficult subject, contained in the first and second Volumes of the Researches in the Alps, published by my brother Hermann and myself.—Adolphe Schlagintweit.

gave us an excellent opportunity of making several physical experiments at a somewhat considerable height.

From this point we went on to Laptel, where we were much disappointed at finding that the Thibetan authorities had done us the honor to give us a guard of nine Hunias, who wanted peremptorily to prevent us from crossing over into Thibet Proper. We staid at Laptel three days, and there as well as at Janti succeeded in making a tolerably complete collection of fossil remains from the Silurian up to the younger jurassic strata.

In order to deceive our Hunia guard, we went along the Niti road as far as Selchell, and from thence tried to make our escape in the night of the 16th of July; we left all our camp behind, and took only four Bhutias, and the most necessary instruments and provisions with us. We had mounted our four Bhutias, and four horses were sufficient to carry all our baggage. We went on during the night and during all next day, and in the evening we had arrived on the alluvial plain which fills up the broad valley of the Sutlej. We thought ourselves now pretty safe from discovery, and were just about to put up for the night in a little valley, when we discovered our Hunias on horseback following our track. Mani especially told us not to shew the least fear of them; they came on crying and hurraing, and the two first of them who got up to us tried to get hold of the bridles of our horses; but we gave them some severe blows with our hunting whips right over the face, which took them much by surprise. They immediately dismounted, making their salams, and saying that they were our frieuds, (we had given them some rupees at Laptel,) but that they had received strict orders to accompany us as a guard. One of them was a Kuchop, or Thibetan Chuprassi; they said that these strict orders had been given on account of the present wars with the Nepalese, since the authorities were afraid that we might be plundered or killed, and that they might afterwards be held responsible for it by the Indian Goverumeut. We ordered one of them to go to Daba (which was uot very distant,) aud to tell the Jungpun, or head Thibetau authority there, to come out aud make the uecessary arrangements with us. As we had expected, the Jungpuu did not make his appearance himself, but his head clerk, or Dink, a decent looking young Lama

from Lhassa came out the next morning, saying that his master had gone to Chaprang (which was of course a mere lie). We had convinced ourselves that during the present war it was impossible for us to go to Mansarower, since even the Bhutias had been robbed and molested by the disorderly Thibetan soldiers, but we determined to try whether it might not perhaps be possible to proceed to the Upper Indus valley, near Gartok, which had only hitherto been visited by Moorcroft in 1812. After endless negociations with our Dink, supported by rupees, brandy, &c., we succeeded in obtaining permission to proceed as far as the Sutlej. We signed a written agreement, stating that we were allowed to remain three days on the Sutlej, and that we were to pay a fine of Rs. 600 if we crossed that river. Accordingly we went on to the Sutlej near its junction with the Gyungul river. After staying there two days, engaged with astronomical and geological observations, we were met by the Bara Mani (Mani's cousin) who had come out to our assistance. He is the welthiest of the Milum people, and has really got much influence in Thibet. He had come a day or two before to Daba, where the Jungpun is his friend and owes him some thousand rupees, and he and the seven Niti Pathans, who happened to be in Daba, negociated with the Jungpun, and must have made a considerable disturbance in the place, telling the Jungpun that we were not people to be ill-treated and driven out of the country with impunity. After two days, the Bara Mani and two of the Jungpun's clerks came to our camp; our brave Bhutias had really succeeded in obtaining permission for us to proceed as far as the Chako La Pass, which lies in the ridge which separates the Sutlej from the Indus. The Hunias had now become quite friendly, and the two Lhassa officials exchanged with us some little presents. We bought from them a number of Chinese articles at an extravagant price, and before long they had all got the conviction that there was no harm in our staying for some days in their country.

Permission had been granted us to remain five or six days on Chako La and the two Manis had pledged themselves in writing to pay a considerable sum if we should go any farther or remain any longer. We were only accompanied by two people of our guard, the others had found it more comfortable to remain at the foot of

the cold mountains near the Sutlej. We lost no time in making the best use of the few days granted to us. On the 26th we arrived on the Chako La, and placed our camp as close as possible under the pass itself.

On the 27th in the early morning, we went away. Numerous Bhutias (who all did what they could to assist us) and Hunias were constantly crossing the pass with their sheep. To avoid suspicion, we left our little tent and the greater part of our baggage, and one of our Bhutia servants behind; one Hunia, who knew exactly where we wanted to go, accompanied us; two horses carried our theodolite, hypsometric apparatus, and some provisions. We told the people that we only wanted to go to a mountain near the pass, to look at the "compass." After crossing the pass, we left the usual track, and went on through a lateral valley. To our great astonishment, we found that the lower part of the valley was filled with more than a hundred of armed Hunias, and our people got much frightened, saying that these men were sent out by the Garpon or resident of Gartok, to catch us, &c. We lay down in a small hole and despatched one of our men to get information. He was soon, however, discovered and surrounded by the Hunias.

We saw with our large telescope that much crying and quarrelling was going on below; they searched his horse and got hold of his gun. After some time, however, they let him go. He had found among these people, who came from Chumurti and were going to the seat of war, one old friend, who had settled every thing. He had told them that we were Gurhwal people and had been afraid of being plundered if we went down into the valley. In the evening we went down a little lower along a small valley, just on the limit of the highest shrubs. The night was unhappily a very bad one. Without a tent, and with only a few blankets, we lay down as close together as possible; in the morning, we were covered with snow more than three inches deep. The sun, however, melted away the snow from the ground, and we were glad to find that the greater part of the troublesome Hunias had gone on early in the morning. We rode as far as we could across the valley where their camp had been, and upon a mountain on the other side of it. The weather had become beautifully clear, and in the afternoon we had the

pleasure of finding ourselves in the Indus valley, some miles above Gartok.

From a little hill on the left side of the valley we had an excellent view over the large valley, and over the mountain ranges which border it to the North-east, and we were able to take numerous angles with our theodolites, and to make some drawings. On the 28th we went on to the Indus river itself, and after taking altitudes of the sun, &c., were obliged by the most absolute want of provisions to return without delay along the usual route to our camp on the Southern side of Chako La, which we only reached late at night. The next day, the 29th, we went out over Chako La again with fresh horses, to one of the peaks of this mountain range, Gunschankoerr, which from its isolated position and somewhat considerable height (19,640 E. F.) promised to be a good station for studying the orography of the surrounding country. The view which we had from the top of the mountain was really magnificent. To the North we had high snowy mountain ranges from East of Kailas along the Indus valley far beyond the confluence of the two great branches of the Indus; right at our feet we saw the great plain of the two Sacred Thibetan Lakes (the water itself was only visible in a few small patches) and the pass which separates the Sutlej from the Brahmaputra. To the South the Himalaya was visible from distant snowy peaks in Nepal far East of the Brahmaputra pass, over Gurla Gumin beyond the high peaks of Bessez, Koenower and Spiti. On the 30th we returned to the Sutlej, and from thence we went by Gyungal and Daba to Mangnang. By degrees we had now got upon a very friendly footing with the Thibetans, and they even allowed us to go into the villages of Gyungal and Mangnang. In the latter place they have a fine temple and some high poplar trees. They showed us the interior of the temple, gave us some books, &c., and contantly expressed their surprise that we were not half so bad a set of people as their Lhassa rulers wanted to make them believe all Europeans to be. We had also taught our Kuchop, or Thibetan chuprassie, what the real duties of a good chuprassie were; and he went every day to considerable distances to procure fresh milk, sheep, &c. from the shepherds. From Mangnang we proceeded Southwards to the foot of the great Ibi Gamin glacier (Gamin or

Ibi Gamin is the real Thibetan name for Kamet); we were met there by some coolies from Mana, with provisions, some additional instruments, &c. Ibi Gamin, which, seen from Gunschankoerr over-towered all the Himalaya peaks, seemed to us to be one of the most favorable mountains to ascend with the view of attaining some considerable height. Furnished with axes, ropes and every thing we wanted for the ice, we left our camp on the foot of the glacier on the 16th of August. We were rather surprized to find that the glacier was one of very considerable ascent; it is an exceedingly regular and very fine glacier, somewhat similar to the Aar glacier in Switzerland, but considerably larger. Ibi Gamin seemed to become more distant, the further we proceeded along the glacier, and at last we discovered that the summit was situated in the most remote corner, at its very source. For three days we went up in short stages along the glacier, sleeping on the heaps of rocks, "Moraines," which border it. On the third day, we encamped at the very foot of the Ibi Gamin, at an elevation of 19,220 E. F., where the glacier valley terminates. We had altogether fourteen people with us; instead of wood we were generally obliged to burn a sort of grass called peaug (a species of Cherleria, if I am not mistaken), which we found on the mountains near the lower parts of the glacier. The night of the 18th had been very cold and stormy, but the following morning was pretty clear; we therefore went out at 8 o'clock to see how far we could get upon Ibi Gamin. Only eight of our people were willing to accompany us; the other hands got quite apathetic, saying that they and we were all about to perish. We soon began to ascend over steep snow, often crevassed, which covers the flanks of Ibi Gamin; halting frequently and making a very circuitous route in order to avoid *crevasses*, or places which were too steep to climb, we rose gradually higher. At last at 2 o'clock it became absolutely impossible to go on any higher: two of our people had got sick and had remained behind, and all the rest of us felt exceedingly tired and exhausted, more so indeed than we had ever been before in our lives. The view which we enjoyed was not very extensive; clouds had been constantly passing around us, but in the clear intervals we had a very instructive view over the glacier masses and

ridges which surround Ibi Gamin. The highest point which we reached had an elevation of more than 22,200 E. F. (22,260 E. F. calculated from Agra). At 2 o'clock a strong North wind began to rise, and this especially obliged us to descend as quickly as we could; the wind became very strong indeed lower down, and we were glad enough when we had all reached our camp safely in the evening. Ibi Gamin re-appeared for some moments between the clouds, beautifully coloured by the setting sun, and it may be imagined that we all looked back with great pleasure upon our route which was distinctly traceable upon the highest point which we had reached. We had got much accustomed to the influence of height, especially during our Thibetan journey, but here not one escaped unhurt; we all felt head-ache and more or less severe pains in the eyes, the latter being especially caused by the furious wind which constantly blew the fine snow dust into our eyes. The night was a very bad one, we had scarcely any fuel left for cooking, the wind threatened every moment to tear to pieces our light tent, the cold was intense, and our people, with the exception of one, had entirely lost courage and the faculty of thinking. In the morning at 9 o'clock, as soon as the cold was a little less intense, we commenced our descent to our second camp, which was in a somewhat more sheltered position. This day we very nearly lost one of our men. This poor fellow, a man called Dolpa, from Milum, an excellent servant, who had been with us during all the Thibetan journey, was taken ill the day before, when going up Ibi Gamin, and had a dangerous effusion of blood. We of course ordered another man to accompany him in going down to the second camp; but his companion made his appearance soon after us at our lower station, saying that he had lost sight of the sick man in the heavy snow-storm which we encountered on the glacier. We immediately sent back two of our people to look for him and when they returned without him three others started, but they could discover no traces of the missing man. The next day we left behind two other men, with strict orders to look after Dolpa, but all in vain. After our arrival in Mana, we had already made all the arrangements with the Putwarri for the family of the supposed dead man, when to our great delight the poor fellow came in three days after us. He had been

lying between some large stones on the Moraine where nobody could see him, and the second day he slowly went down to our first camp at the foot of the glacier. Unhappily our men with the horses and yoobus had already left, and the poor man remained three days without food in the wilderness, when he met some Mana people, who brought him on. He was bad enough, and had his feet injured by frost, but we think that he will entirely recover before long. In the afternoon of the 20th the weather again became fine and clear. We completed our survey of the Gamin Glaciers, and made our preparations for the next day's march. At the camp we had found some wood and fresh provisions which had been sent up by Mani, whom we had left at the lowest station, and all our people recovered again satisfactorily. The great Gamin Glacier, and all the part of the country where we had now been, lies within the boundaries of Thibet. To reach Badrinath we had still to cross a high Glacier Pass. We had heard of the existence of this Pass (quite a different one from the regular Mana Pass) only a few days before from a Mana coolie who was with us; he said that formerly it had once been passed with sheep, but that now it was quite deserted. Neither he nor any other man of Mana had ever made the Pass, but he knew about the direction in which it was likely to lie, and he undertook to find the road and to lead the party. On the 21st we went up along the Western branch of the Ibi Gamin Glaciers and slept on the highest Moraine. On the 22nd, with beautiful clear weather, we proceeded further and after some detours and mistakes, we happily reached the pass as early as 2 o'clock. It was much higher and much more difficult than we or our people had expected. It is no doubt one of the highest passes in the Himalayas, being 20,430 E. F. above the level of the sea. We were extremely glad to have found a passage, since otherwise we should have been obliged to make a long and tedious detour down the whole of the glacier and round the Mana Ghat. From the top of the pass we discovered a large glacier trending to the South-west, and saw before us a considerable part of the range separating the Mana from the Nelong valley. The Glacier was the Sursutti Glacier; we went down along it and at night encamped again on the "Moraine," near a place where we found the first peaug. We

broke to pieces all our sticks, tent-poles, &c., and they gave sufficient fuel to prepare some dinner, of which we and our companions were much in want. At last on the 23rd we arrived at Sursutti at the foot of the Glacier, in the valley leading down to Mana and Badrinath. We can readily understand why the people of Mana have given up this dangerous and fatiguing pass, which is certainly ten times worse than the Pindari Pass, on account especially of its great distance from wood and from the nearest villages where any supplies can be procured. We slept a little below Dhanran, where we were fortunate enough to meet some people going to Thibet, who provided us with some rice; and in the evening of the 24th we arrived at Badrinath, where the people had been looking out with some anxiety for our arrival.

Notice on the دوادا القلوب *of Mohásaby being the earliest work on Súfism as yet discovered, and on an Arabic Translation of a work ascribed to Enoch.—By* A. Sprenger, M. D.

Much has been written of late years on Súfism. The greatest advantage of these essays, consists in the ignorance of the authors of what Súfism means. They took a quotation from one book and a quotation from another book without much regard whether they treated on the same subject—and by the illicit process of *humano capiti cervicem jungere equinam* they produced the most phantastic systems, which were sure to be welcomed by an age which loves the *piquant*. Illusion is the greatest pleasure in life, and hypotheses are the charm of science, it is therefore, with some remorse, that I introduce the work of Mo*h*ásaby to the notice of the reader, as it may tend to destroy illusions which some worthy orientalists have conjured up. I am consoled, however, by the consciousness that my notice is extremely imperfect.

It is considered as a settled question that Súfism was from its commencement a system of metaphysics or pantheism; or at least that pantheism was its root and life, and asceticism a later addition. We know that during the Middle Ages, members of religious orders became pantheists but when will the day come that the followers of Spinoza or Schelling will turn ascetics? As to whence this system

came to the Mnsalmans opinions are divided. Some think from Greece and others from India. What has not come from India! I have observed that people in India smile when they are pleased, and cry to express grief, and as this habit also prevails in Europe, I am convinced it has been introdnced from India, and I shonld think by the great mercantile road of ancient times because in Arabia and Syria I observed the same extraordinary practice. If these learned persons would only mention the works on Pantheism which have been translated from the Sanskrit into Arabic, or the Snfies who in early times have visited India. It is true we read of translations of some few medical and astrological works, but it is eqnally true that this does not imply that also works on Pantheism have been translated. But snpposing it did. We cannot point out a single principle in Avicenna or any other Arabic author on medicine which has been taken from the Sasruta. These translations from the Sanskrit were, therefore, sounds in the desert air. I have seen at Cawnpore a very elaborate work in Arabic on the Copernican system of astronomy, which was written nnder Akbar. This system can be expressed in one word and it changes the whole aspect of the science. Yet observatories have been built in India after that time and astronomical tables have been calcnlated with great expense and labour, and this system has been completely ignored, thongh astronomy is not connected with religion. Notwithstanding this and similar examples, people consider themselves excessively learned, if they start a theory so silly as that the Mnsalmans have taken from the Brahmans, a system of philosophy and asceticism, which is intimately connected with their own religion, and which in the form in which we find it among the Snfies, never existed in India; and we are expected to receive this theory as a fact, thongh not one single historical proof is adduced in confirmation.

Báyazyd Bistámy who died in 261 says, *apud* Dáráshikóh, *Hasanát al'árifyn*, "The seed of theosophy معرفة has been pnt into the ground at the time of Adam, at the time of Noah it came forth from the ground, at the time of Abraham it was in flower, at the time of Moses the grapes began to grow, at the time of Christ they came to maturity, and at the time of Mohammad pure wine was made of them, and the drunkards among his followers indulge in it,

until they get so much drunk that they lose all control over themselves and exclaim "Praise to me, is there any greater being than myself," or "I am the *Verum* (das Wahre in the sense of Hegel, i. e. God. The word in the original is الحق). There is no God by I."

This idea on the origin and progress of the pantheistic system of theology and philosophy is wild, but it is much more sensible than that of European writers. 'Abd al-Karym Jyly goes farther and attempts to show that Paganism, Magism, Judaism and Christianity were successive steps in the development of our ideas regarding God which came to perfection in the Islám or rather in the system of the Súfis. 'Abd al-ghanny Nábolsy has written a monography on this subject which has the title الكشف و البيان عن اسرار الاديان.

The MSS. of which I intend to give a notice belongs to the Syrian Society at Beyroot, No. 601, 8vo. 600 pp. of 26 lines. It is one of the oldest I have seen, having been copied at Alexandria in 486. At the end is the following note نسخت قال فى اخر الام التى هذه الكتاب منها قال قوبل جميعه بالام وهى بخط ابن عزرا رحمه الله تعالى على قدر الطاقة و الاجتهاد

The title of the work is رسالة دوادا القلوب و معرفة همم النفس و ادابة and it contains instructions of a Pyr to his disciple, who it appears took them down and whose name is A*h*mad b. 'Açim Antáky (i. e. of Antioch). The book, in a great measure is in the shape of a dialogue which is very well managed. The name of the Pyr is mentioned in several places, viz: Abú 'abd Allah and in the postscript, the date of the demise of Mo*h*ásaby is recorded, viz. 243. For the traditions which occur in the book, invariably the isnád is given in full, and it appears from it that one of the teachers of Abú 'abd Allah is Mo*h*ammad al-Çabáh, who according to the Kamál died in 227. All his other teachers, whose dates I ascertained, flourished about the year 200 of the Hijrah. We may therefore be justified in identifying Abú 'abd Allah the author of this work with Abú 'abd Allah al-*H*árith b. Asad Mo*h*ásaby, of whom we find the following account in Asnawy's Sháfi'y Biographies:

ابو عبد الله الحرث بن اسد المحاسبي سمي بذلك لكثرة محاسبة نفسه ذكره الشيخ و كذلك بن الصلاح فى طبقاته فقال ذكره الاستاذ ابو منصور التميمي فى الطبقة الاولى من اصحاب الشافعي و قال هو امام المسلمين فى الفقه

و التصوف و الحديث والكلام وكتبه فى هذا العلوم اصول من يصنف فيها ولو لم يكن في اصحاب الشافعى فى الفقه و الكلام و الاصول و القياس و الزهد و الورع الا هو لكان مغبر فى وجوه مخالفيه و الحمد لله على ذلك انتهى كلامه و قد اعترض عليه ابن الصلاح و صحبته للشافعى لم ار احدا ذكرها سواه و ليس هو من اهل هذه الفن فيعتمد عليه فيما يفرد به و القراين شاهدة بانتفايها توفى سنه ثلاث و اربعين ومائتين ببغداد *

" Mo*h*ásaby has this name because he kept such a strict account (Mohásabah) of his own conduct. Abú Mançúr places him *apud* al-Shaykh and Ibn al-Çalá*h*, into the first tabaqat of the followers of Sháfi'y and says, 'Mohásaby is the Imám of the Moslims in law, Súfism, knowledge of traditions and dialectical theology. His writings on these subjects are the works to which later authors are chiefly indebted for information. If the sect of Sháfi'y did not count any other man, who distinguished himself through his knowledge of law, piety and other great qualities, the name of Mo*h*ásaby alone would be sufficient to discomfit its adversaries.' Ibn al-Çaláh opposes this view and maintains that he no where else saw Mo*h*ásaby mentioned among the followers of Sháfi'y, and says that he is not to be counted among theologists at all, though he is the great authority in his own science. Ibn al-Çaláh's assertion seems to be borne out by facts. Mo*h*ásaby died at Baghdád in 243."

Jámy, *Nafahát*, No. 32, states that he was a native of Baçrah but was settled and died at Baghdád, and that he left several works. Qoshayry informs us that his father left at his death a large estate but that he refused accepting any thing of it, because he had been a Predestinarian. Qoshayry, Sha'rány, Jámy and others give also an account of Antáky but mention neither any date nor any interesting fact. I possess another work of Mo*h*ásaby which has the title of مقاصد الرعاية.

The first chapter of the book is inscribed:

On Reason.

Reason العقل is the most precious gift of God, because by its means we come to the knowledge of the other gifts which God has bestowed upon us, it leads us to thank Him and to resist the demands of our appetites. The sign that reason is alive in man is, that he

is able to distinguish between what is evil and good (literally the *verum* see Logic note 21) and what is vain and transitory, between what is useful and what is hurtful, and between what is beautiful حسن and what is hideous and the object of his lusts. He who does not make these distinctions, is the slave of his appetites. The most precious of all gifts of God is faith in our Creator. The essence of this faith is that we act up to the duties which God has imposed upon us. If you ask me what is the Yaqyn (intuitive knowledge) ;* I answer it is the very essence of faith, the fruits of which are purity of life—action, but action in which our object is not honor or any reward, except the reward from Him. He that has received his reward in this world, has to expect no more on the day of resurrection.

The most fruitful intuitive knowledge (Yaqyn) is that which increases in your eyes the importance of the intuitive knowledge which you already have and lowers the importance of every thing else, and which increases your fear of a future retribution. The most useful fear is that which guards you against sin, and leads you to repentance for past sins. The most useful hope is that which makes it easy for you to do that which leads you to the accomplishment of your hope. The best poverty is that which you bear patiently and with a cheerful heart. The best riches are those which remove the fear of poverty from your mind. The most useful knowledge is the knowledge of ignorance which brings you injury and the knowledge which increases your contrition and impels you to action. The most useful humility is that which guards you against pride and extinguishes anger in your heart. The most useful despair الياس is that which kills cupidity in you, for cupidity is the key of debasement, it deprives a man of his reason, soils his sentiments of honor العرض and his generous feelings,and extinguishes the light of knowledge. The virtue which has the most pernicious consequences is the one which you look upon with complacency, and on which you place your reliance—it is not virtue but conceit with

* Yaqyn means that which is certain, *certum*. Continued contemplation leads the ascetic to the intuition (i. e. a view with the eye of his mind) of what is supernatural, and this view becomes more and more distinct and is the only certain and positive knowledge which man possesses. It is faith raised to the highest power.

which you deceive yourself. The places where you are most private are your cell صومعة* and the interior of your house, and in fact every place where you attract no notice, and where disturbance cannot reach you.

The most precious favours of God are three: sufficient reason to combat passion, sufficient knowledge to combat ignorance, and sufficient wealth to combat the fear of poverty. The best religions war is war against our own lusts, in order that the heart may become more susceptible of truth; and the most dangerous of our enemies is the one who is nearest to us, who is most concealed and who encourages all other enemies to attack us: it is the devil who inspires evil thoughts into our hearts. The most pernicious of all sins is obedience to God's commands in ignorance. What, asked the disciple, it is more pernicious than disobedience in ignorance? Yes, replied the teacher. Do you not see that you expect no reward for a sin, but you expect a reward for good works done in ignorance (اعمال الطاعات بالجهل) whereas you deserve punishment for them. A sin which you never forget and of which you continually repent is more useful for you than a good action which fills you with conceit.

On the knowledge of one's ownself and on contrition.

He who does not know his ownself wanders in error, but he who knows his ownself and the secrets of his heart will be in fear. Indeed the want of fear and the want of shame is a sign that a man does not know his ownself. Again, a want of fear produces a want of contrition, and a want of contrition leads to the destruction of the heart (conscience). A house which is not inhabited falls into ruin, in like manner a heart which is not tenanted by fear and contrition rushes into its own destruction. It is security which destroys the heart, and fear and contrition which build it up and illuminate it. It is, however, not the fear and grief of this world which quicken the heart—they are maladies and destructive to it—but the fear and contrition about the world to come. The contrition for the world to come has a sweetness and a pleasure which increases as the contrition increases, but the grief for the sake of this world is bitter, and its bitterness increases in proportion as the grief increases, because the former leads to God and the latter from

* صومعة means hermitage but not monastery.

God. Fear and contrition for the sake of the world to come awaken the unwary from the sleep of neglectfulness, they give him strength to keep awake during the night and to bear the thirst of day, they give him patience in adversity, they accustom him to behold the unity of God and make him despise the world, they induce him to retire from society and make up to him for privatious. If man is in this state of miud, his longing for the next world awakes, and he is endowed with energy. The root of all this is knowledge of one's ownself.

On the various classes of men.

Men may be divided into four classes: either they are iguorant and give themselves up to their lusts, or they are learned and filled with conceit. In proportion as their learning increases so their pride increases, and on account of their erudition, they look down upon others. Or they are devotees, but ignorant, they look down upon those who are less devoted than themselves and lay claim to being respected and venerated. Or finally, they know the right path aud delight to walk upon it, they are humble and being unable to act up to what they know to be their duty, they are in coutrition and sorrow. This is the best class of men. Some one told me that he heard Yúsof b. Asbát say, "The aspirants مريدون are lost for they are unable to resist the attractions of this world, and lose thereby the road of the life to come. And God does not excuse auy one who does not act up to his commandmeuts, nor does he accept a good work which does not proceed from the purest motives.* And a man is judged by his actions." This is a very hard sentence and few are able to act up to it on account of the influence which our desires exercise over us.

Caution in speaking.

God has servants who out of fear of the punishment [of hell] are extremely cautious not to speak more than is necessary, and they are of opinion that monastic life رهبانية consists in acting instead of speakiug. Among this class there are men of high intel-

* The word which I translate by "purest motives" is çidq (literally veracity and sincerity) it is said in another passage "the most useful çidq is to confess to God our own faults and the wickedness of our actions. The author uses اهل الصدق for "pious men."

lect, yet who go so far in tacitnrnity that yon wonld take them for idiots. They are aware that much evil arises from too free a use of the tongue, but that if employed in prayers, it leads to eternal happiness.

On Vanity التزيين.

The vanity [of pious men] is of three kinds: wilfnl vanity, vanity committed in ignorance (out of want of self-knowledge), and vanity which consists in the profession of the absence of vanity. The last description is the greatest vanity and the one most welcome to the devil.

Next follow two chapters on covetousness, which the anthor considers as practical infidelity, and in praise of contentment with moderate and honestly acqnired means. The words which he addresses to the rich bear a close resemblance to the declamations of the Pseudo-Enoch to be quoted lower down. He begins يا خادم الفتنة و اسير العادة وضيف النحلة و نزيل الرحلة ما اقنعك درها حتى عدوت عليها و لم ترض ما اقتصر الذيب منها حتى دبغت جلدها وخرطت عظمها و اغتزلت وبرها و رايت اكبر الحظ لك ان يكون جوفك مقبرة لميت الحيوان الخ *

O tool of distnrbance, prisoner of fashion, imitator of the opinions of others, and gnest in this earth, you are not satisfied with what it offers to yon, but nse violence; nor are you as contented as the wolf, bnt you tan the hide of yonr prey, you tnrn its bones in the lathe and spin its hair. Yonr greatest happiness consists in making yonr belly the tomb of dead beasts, &c.

In these two chapters the author indnlges to some extent in that cynicism of which most oriental ascetics are guilty. Bnt to his justification it may be said that owing to the nncertain tennre of property nnder an absolute government, it is not honest industry which leads to wealth in the east. The only men who enjoy a shortlived affluence are the oppressive official and the sordid usnrer, both of whom are equally detestable. Again for the same reason, wealth is not employed in any enterprize of pnblic utility, bnt for display and to gratify sensnality. We can therefore "hardly be snrprised if they show but little respect for what we call industry. On the whole, it must be admitted that the ideas of the anthor are as pure and elevated as those of Thomas à Kempis and far more

sensible than those of Gerson. The following chapter proves that he was not without common sense.

On reliance on God. التوكل

Every man ought to arrange his conduct, both as regards the affairs of this world and those of the world to come, with prudence and caution, and whenever he enters on an enterprize, he ought first well to consider every thing, but having done so he ought to place his reliance on God, and after he has done his best, he ought to expect more from the assistance of God than from his own endeavours. He must for the rest never forget that God in his wisdom has arranged so the affairs of this world that success depends on circumspection and caution ولكن الله قدر بحكمته امور الدنيا على حسن النظر و الاحتياط. The sign that a man places his reliance on God is satisfaction رضا and submission تسليم [to his will], if God bestows any thing upon him he accepts it gratefully, and if he has no success he bears it with fortitude and satisfaction. Satisfaction رضا must be distinguished from contentment قناعة. The latter term means the opposite of cupidity. Satisfaction means cheerfully to submit to the will of God in adversity and prosperity.

The author takes generally the revelation in its literal meaning and considers heaven and hell as the principal inducements for leading a pious and virtuous life. Later Súfies insist exclusively on the love of God for his own sake and treat these considerations with scorn. The only speculations which I could perceive in Mohásaby's book are contained in the following two chapters, which are partly a repetition of what has already been said.

On the root of piety.

The root of all what we have said is the Ymán (faith) and the Yaqyn (this word means originally "that which is certain" and is used by Súfies for intuitive knowlege). Faith and intuitive knowledge are the root and the branches and the life of the servant of God, as water is the life of a plant. If a plant is watered, first its roots absorb it, then it rises into the stem and is distributed to its branches. In like manner if a servant of God is firm in his faith and in the intuitive knowledge, first his heart within him becomes strong and then there grow from it those virtues which cannot exist without sincerity (çidq), fear of God, reliance in God, simplicity of

heart, humility and contrition. These are all internal virtues, the results of sentiments of the heart, but as soon as they have gained strength, they will show their fruits through your hands and tongue, for if the heart is truly pious there is no difference between sentiments and actions.

On faith.

The disciple said: Are not faith, intuitive knowledge and belief in the unity of God, terms for one and the same thing? Again, is not the law of God for his servants and the law of the prophet for his church equally identical? The spiritual guide answered: No, every one has a separate meaning. Belief in the unity of God means the *h*anyfy faith (see my Life of Mo*h*ammad, p. 169), Islám means the church, faith (Ymán) means belief [in the truth of the religion] and acting up to its precepts, and intuitive knowledge is the very essence of faith, and it shows itself by the purity of action التوحيد اسم و معناه الحنيفية و الاسلام اسم و معناه الملة و الايمان اسم و معناه التصديق و حقيقه العمل بالفرايض و اليقين اسم و معناه محض الايمان و مصداقه اخلاص العمل. The law (Sunnat) of God for his servants is stern and consists in hardship and misery in this world, but the law of the prophet consists in mercy and blessing.

[To represent the law of Mo*h*ammad as the law of mercy is a very striking idea, but it is ancient and founded on the sayings of Mo*h*ammad himself.]

On the bounty of God.

God has not created this world at random nor has he allotted it to man for his dwelling-place without object. He has had a high purpose in the creation. He has commenced the work of creation by bounty, and he has thereby imposed the duty of thanksgiving upon us, and has promised us an increase of his bounty if we are grateful. His bounty is not confined to the pious, but it extends also to the sinner, and it is of two descriptions: evident and secret. Only the intelligent and those who study the mysteries of God recognize the latter. Motion and rest, pleasure and misery, solitude and society, laughing and weeping, privation and plenty, health and sickness, all have a benevolent object, and for all we owe equally, thanks to our Creator.

On obscurity.

Al-Haytham b. Jamyl says, I asked Fizáry his advice regarding the choice of a residence, and he said, Choose the most retired and obscure place where your voice cannot be heard.

On duties and what is in excess of duty, also on good actions and bad actions.

You must be just before you can be generous, you must perform your duties before you attempt to perform meritorious actions which are not enjoined by law, and you must avoid sin before you do good works. To abstain from sin is the foundation, and meritorious actions are the superstructure. If the basis is firm the superstructure may fall and the basis may remain, but it is impossible that the basis should fall and the superstructure should remain. It is self-deception if you feel a desire for good, without a desire to avoid evil. The necessity to avoid bad is much greater than that of doing good, for it is our duty to avoid every evil action, but not to do every good one.

Here follow fifteen short chapters which do not appear to contain many new ideas, and after them a few pages seem to be wanting. After the *lacuna* are six pages of traditions without heading and then follow the Shubhát (scruples) which fill the main body of the volume, viz. 184 pp. whereas what precedes them fills only 38 pages. There is no doubt that the whole is by the same author, but the scope of the shubohát is so different from that of the preceding pages, that it is not unlikely that they form a separate work, of which the commencement is lost.

In the Shubhát doubtful questions on law and ethics are illustrated by quotations from the sayings of the prophet, and his most distinguished pupils, and by the example of the primitive age of the Islám. The author says that many persons if there is a doubt whether an action is wrong or right, think it safest to declare that it is wrong, but he adds such a proceeding is as sinful as to declare that a wrong action is right. He therefore takes great pains to distinguish between both, and to found such distinctions on the safe basis of revelation and prophetic ordinance. He recommends however wherever he is unable to decide whether any given action is lawful or not, to go the safest way and to abstain from it.

Most of the questions which he discusses bear on property. The manner in which the land conquered by the early Musalmans was disposed of, gave rise to discussions which seem to have much occupied learned and pious men during the first three centuries. I will give an example. The country about Tarsus was obliged to surrender to the Moslim arms unconditionally, and consequently it was, according to the principle laid down by 'Omar, the property of the Moslim *community*, but the reigning Khalif, who according to the original notion of the Islám is merely the servant of the community, divided it among his adherents, generals and partisans. He had no right thus to dispose of it, nor were these persons justified in accepting it, and consequently, though the land may have frequently changed owners from the time of the conquest down to the age in which our author lived, he considers it as unlawfully acquired property which no man of principles would purchase, nor would he purchase the produce thereof, and he goes so far as to recommend to those who resided temporarily in those regions for the sake of repressing the inroads of the Greeks, to send for their provisions to Egypt or Syria. Most of the other questions which he discusses are of the same description. The principal theme of the whole work is an unqualified condemnation of every thing that the executive السلطان ever did since the demise of the first four Khalifs. The only sovereign whose acts he considers legal is 'Omar b. 'abd al'azyz. We must not suppose that he challenges the right of any of them to rule. This question he does not discuss, and from one passage, it would appear that he conceives that a man who reigns *de facto*, reigns also *de jure*. But he seems to consider the sovereigns as well as their officers as a band of thieves and robbers, and goes so far as to lay it down as a general rule, that, as the whole or at least part of the property of public officers has been acquired unlawfully, their heirs are not justified in accepting it. Herein he preached not only in words but by example, for he refused to accept seventy thousand dirhams which his father left him, because he (his father) believed in predestination القدر and he thought it wrong to share in the inheritance of a heretic. There can be no doubt, that the Khalifs and their officers violated the constitution of the Islám at every step. We should however very much misunderstand the author if

we conceived that he has any political views. His only object is to save his soul, not however by praying and fasting alone but by scrupulously acting up to the commandments of God as laid down in the Qorân and Sunnah. He goes very far in his scruples. Starting from the principle that a person who purchases, or accepts, or makes use of unlawfully acquired property, he considers it unlawful to pray in a mosque or purchase the necessaries of life in a market, which stand on ground to which the owner has not a clear right, or which have been built from means which have not been lawfully acquired. It is hardly necessary to say that he condemns in the strongest terms even those who accept from the servants of the government or other persons, whose hands are not pure, pecuniary assistance for performing the pilgrimage, or for proceeding as volunteers to the frontier for fighting against the enemies of the Islám. Abstain from sin, before you attempt to do works of piety, is his motto. He therefore praises Yúsof Ibn Asbát (d. 196,) who says, that he had come all the way from Transoxania to Syria not in order to fight for the Islám, but to gain his livelihood by tilling a ground which was in the hands of its lawful proprietors.

It appears from quotations of the sayings of pious men of the first and second centuries that this resignation and contempt for the world were very common immediately after the termination of the civil wars between the family of the prophet and the Omayyides, which ended in establishing a selfish despotism. He often quotes Awzá'y (d. 157 at the age of 72), *H*asan Baçry (was born during the reign of 'Omar and died in 110), Sofyán Thawry (was born in 97, d. 161), Táwús (d. 106), Ibn Syryn (d. 110 at the age of 77 years), and Fodhayl b. 'iyádh (d. 187) who held the same opinions. It farther appears (particularly from pp. 185 *et seqq.*) that they arose from the disgust with which these men were filled in witnessing the oppressions of the government. The origin of Súfism therefore is not due to the introduction of some exotic system of philosophy from India or Greece. As leaves, flowers and fruits are the natural results of the development of the seed that is put into the ground, in like manner Súfism is the result of the development of the Islám. As manure promotes the growth of a plant, thus Súfism has in the earliest times profited by works of edification (like the books

of Enoch) and mystical books (like the *Theologia* ascribed to Aristotle) translated from the Greek into Arabic. But the number of these works is extremely limited, and their influence was so small as to be hardly perceptible. At a later period, repeated attempts have been made to recast it in the mould of Aristotelian dialectics, and in the seventeenth century of our era, some works on theosophy have been translated from the Sanskrit into Persian for the special edification of Súfies. Notwithstanding those extraneous elements, Súfism is probably the most original and genuine phasis of the development of the Islám, and well worthy of the attention of the student of Mo*h*ammadan history. In a notice which I intend to write on the Risálah of Qoshayry, I trust to be able to point out how from the system of ascetism which we find unmixed in the work under review, a system of theosophy grew up which gradually became more and more pantheistical and grew to such importance, that many authors consider pantheism and Súfism as identical.

In the same volume and written in the same hand is another work, which is equally of great interest. It is an Arabic translation from the Greek of four books of Enoch. I have not seen the apocryphical work of Enoch, which has lately been translated into English, but from what I have read regarding it, I conclude that these books are not identical with it.

The translation is in rhymed prose, but no sacrifice is made of the sense to the rhyme which would have been the case if it was an original Arabic production. The style and language are very peculiar and almost unintelligible. I should not be surprised if farther researches were to show that it is not in the dialect of the Hijáz, which through the Qorân became the writteu dialect, but in the dialect of one of the Christian tribes, like the Taghlibites or the *H*yrians, and that it has been translated into Arabic before Mo*h*ammad.

The MS. uuder review was copied from one in the hand-writing of the Grammarian Abú Bakr Mo*h*ammad b. al-*H*asan, for whom it was probably interesting ou accouut of its lexicographical importance. It is not unlikely that by referring to ancient philological books, we shall be able to ascertaiu to which dialect some of the words are peculiar which occur in this translation, and are not met with any where else.

The title page of the work runs:

كتاب فيه ذكر الصحيفة الغراء و الصحيفة المعروفة بالرحمة و الصحيفة المعروفة بالصفرا لادريس النبي عليه السلام منقول الفاظهن من اليوناني الى العربي تعبيرا عنهم منقول من خط ابى بكر محمد بن الحسن النحوي

This book contains the Admirable Book, and the revelation called Mercy and the revealed book called Gold, of the prophet Idrys, freely translated from the Greek into Arabic. It has been transcribed from a copy which is in the hand-writing of Abú Bakr Mohammad b. al-Hasan the Grammarian.

These four books contain exhortations to a pious life. The first fills five pages and begins سافرت الافكار في عظمة الله جل جلاله و لطفه بخلقه فاوغلت فى المسير و تعسفت الخطير ثم رجعت حسيرة قد زادها ما استعرضته تقصيرا عما التمسته فنادت يا مالك السرايرو مرشد البصاير ايقنا انه لا مذهب و رأك و لاحول لغيرك و ان كل فعل صدر عن احد من خلقك لم يصبحه اخلاص لك ويحدوه سايق من توفيقك فهو مضلة للاذهان وحيرة للالباب و معدل عن السبيل الجانح اليك المعتمد عليك يا لذة المحطيئة حلت بين المذنب و بين رشده وارتهنته بسخط ربه ثم اجليت عنه و خلفته موفرا بالتبعات متعبدا بالشهوات قد عدل به الشوق اليك عما خلق له و انساه ما توعد به

My thoughts were wandering in the greatness of God—may his glory be exalted and his mercy towards his creation increase—they proceeded on their road in perturbation, and were agitated by great objects. Then they returned pauting, for their observation convinced them of the inability of obtaining what they went in search of, and they exclaimed: O Lord of the thrones, O guide of our intellect, we are now convinced that there is no way beyond thee, and no one possesses power besides thee. We are convinced that no work which man performs behind thee is accompanied by sincere devotion towards thee, a power turns it so that it misses thy aid: it is a stumbling block for the intellect, causes confusion to the hearts and turns men away from the road which leads to thee and rests, upon thee. O illicit pleasures, you step in between sinners and the guidance of God, you pledge man to the wrath of God then you exile him from God and leave him suffering under the consequences and a slave to lust. His love towards thee, O pleasure, leads man away from the object of his life and makes him forget retribution.

The second book fills only three pages and begins:

ضجت الملائكة من خطا المذنبين و جور المتسلطين و تكبر الموحدين و قنوط الممتحنين فناداها مالك سرها و جهرها لما اثرت اقبح مما انكرت انك محجوبة على حسن الطاعة خالية من العلايق الشاغلة قد بصرت رشدك وجذبت الى حظك و اسكنت من الملكوت بنحوة تتقاصرعنها الفتن ولا ترقا اليها المحن وعبيد الدنيای سجون من اجسامهم و ما تقتضيهم اياه مما يعدل بهم عن فوزهم تجذبهم حواسهم الى عصيان عقولهم قد حجب عنهم ما يفضون اليه من مدد اعمارهم *

The third is not named in the title page, it is inscribed الصحيفة and fills only four pages, Bg. المعروف بالغمامة يا من أمهل فطغى و قوي فبغي و ساهم فعدى و لم يرا فتوهم انه لا (*sic.*) يرى كم تتظلم منك جوارحكم و يشتكى قبيحكم مشاعرك و تتمادي فى خطك و تنقاد لذلك قد جعلت ما أهدى اليك دريعة لما حظرعليك اطاعت السموات وعصيت وخشعت الجبال ونايت يضفف عملك و يقوى املك و يقرب اجلك ويبعد وجلك تستغش المايل اليك و تستصبح الحاطب عليك و تنفرد من القريب منك و تستبطي النازح عنك قد انساك شكر الشهوة عايد التجربة و غلبة الهوى ثمرة الموعظة *

The fourth fills 15 pages of 27 lines and is divided into seven Sifrs, which are inscribed.

1. مخاطبة النفس الناطقة. 2. مخاطبة a word cut away. 3. مخاطبة الملك. 4. Wanting. 5. مخاطبة الفقرا. 6. مخاطبة الراغب. 7. مخاطبة اصناف الناس.

Beginning بجود الله ظهرت معلولاته وبحمله تشرد عنه من لم يعجره يا ايها النفس العادلة عن حاظها و الجايرة في قصدها و التي شغلت بجماحها عن صلاحها اما تستحى من ضيق محبسك الطامس لفضايلك والمانع لعوارفك و انخفاضك عن منازل الرفعة و متذللك بعد تكامل المتعة وعزوف ما كان متيسرا لك *

The above specimens will convey an idea of the peculiarities of the style and language of this singular work. In order to show more fully its tendency, I give some further extracts:

السفر الثالث في مخاطبة الملك يايها المملك الحقير في المكان الصغير فى الزمان القصير ابكيت الملائكة من رحمتك و بهرتهم بجرأتك وساورت ما به اكثر الفضل عنك انك لا تملك من لا يملك

Here the codex is defective.

السفر الخامس مخاطبة الفقرا * مرحبا بفريق تجردوا من مذارع الفتنة three lines not legible فد نبذ الغل من صدورهم وطرد النفاق عنهم وجانب الكيد محالهم و كفوا همس الحاسد و خديعة القاصد ومودة المخالق و استشعروا الصبر ووقفت امالهم على كفاف العيش و ترجيه ايام الحياة فظهورهم خفيفة و مصادرهم امنة و طرق رجايهم مستقيمة لم تتشعب مآخذها (*sic*) بين الوعر المخطر و السهل المردى اي قوم انتم ان غليتم كلب الحسايف و وقدة الحاجات و اقتضاء العادات و سوء جوار الاغنيا لكم بما يظهر مما فى طباعكم الاستهتار به و حنين اطفالكم الى ما فى ايديهم و ما تقارعون من حس الشكوي و تسلط البلوى * ان الدنيا دار عمرها الغربا عنها و وكلوا بمصالحها و وعدوا و توعدوا فيها و ضمن لهم ما يقيم اجسادهم البالية و حاجاتهم المستقيمة و عرفوا قصر مددهم و حصولهم على مجازاة اعمالهم فنسى اكثرهم ما وكل به و طلب ما وضع عنه واستسلف ليومه ما في غده ولورده حيرات صدره وكان ظنه بما حواه احسن من ظنه بما وعده باريه فتخطا الشايع و نسى مواقف مسايله حتى اذا دعى اليها خرج منها وحده من بين ما اثره و غلب عليه و هو يتمنى انه كان اقام فى الدنيا مقامكم و تهيا له بها ما اتفق لكم ان صابركم مصاب لفتن الدنيا مجاهد لها فان شكا بثه و اطاع مشوره الفاقه عليه انهزم منها و رجع بين البوس والذلة و ان اقام على مجاهدته هرمها و كان حرا بطبعه و مرضية عند ربه جل ثناوه *

Eight lines not legible.

[كثرة المال] التى هى لجماعتهم كالماء الزايد على حاجة ما سقاه من الشجر يعفن اصوله وينقض من مطعوم ثماره و رايح ازهاره * يا هاولا ابعدوا من الاغنيا فانهم لا يربحونكم في ذات ايديكم شيا الا خسرتم اكثر منه فى ذات انفسكم انكم ترون لهم مجتمعات سريعة الافتراق و رايقات لا ثبات لها و لا عهد لشى منها يحول بين المر و التجرد بما قصد له و تحثه على مسالمة الايام و الاباق من ربه الى الاثام و التشاغل عن تأجج فضيلته و ظهورها باستعراض معاء المحظورات المقهورات التى اسرها قسمه و هى متصديه لمن هى اقوى منه فان احببت ان ترى فضلك عليه فاستبقا جميعا الى سنه متعبه او فضيلة مستصعبه حتى ترى تخلفه بالعادة المرذولة و العلايق الذميمة و غدوك اليها خفيف الظهر قليل الوزر هذا فى محياط فان حضرتك

منيتك سرك خروجك الى ربك طاهر الاثبات قليل الاحتكار و ان حضرته تتابعت عليه الاحزان من مفارقه احبابه و التاسف على فوارطه ثقيل الظهر خائب السعى قد ترك ما خول وقصر فيها قدم * انك بالفاقه متهىٔ باثواب الزهادة وهو ارضى ملابسك عند باريك وليس يصل اليه من لم يخلع ثوب الترفه و لو حاول الغنى خلعه اغول عليه شمله واخوانه و احبته والاته وذخايره حتى يرده الى فقر النفس بهذا الكلف السيبه العهد الكثيرة الافات * انكه بفاقتك مقلت من حبايل الشيطان و تملق الاخوان وتكذب المنقطعين يصدقك من استبريت حاله فى ميله اليك و انحرافه عنك و تتحقق اوزان معاملتك و الغنى يتقى جانبه و يرجى بايله فهو مجزف اللقاء مسدود المشاعر لا يصدق فى المشورة و لا يلقى بالحقيقه بين محروم يحسده و مرزوق يمذقه مخدوع مدة كفايته وغناه فاذا قصرت الاحوال به تجلت غياهبه و ندم على فوارطه و خضع لمن لا بلوى عليه وحار فى امره حتى تتفقه انت لما بلوته عند صحوك فى سكره three words illegible ان اغلظ ما اخافه عليك الاحتشام من الاغنيا فى بذاذه one or two words illegible فتتشبهوا بهم فى زيهم فتكونوا بمنزلة قوم قد صحت ابصارهم يحتشموا من لقا مكافيف فى مقصر عن زيهم ان الترفه قد طمست بصاير الاغنيا و اذهلت قلوبهم حتى اعتمدوا على الزى الظاهر الذي ارضا الاخساس وتركوا زي الباطن الذي به لهم العقول و رضى محركها قد شغلهم تاليف فضايل ما جمعوه عن العنام على انفسهم و اظهار فضايلها فهى كالسيوف التى ركبها الصداء من اغباب الاستعمال و منعها عن قوة التاثير و اعتمد اصحابها منها على كثرة الحلية انهم مثل الثمرة ظاهرها لذيذ باطنها منيع و انتم مثل جوزة بطينها حليب و ظاهرها خشن ان اربح الاغنيا من تصور ولهج بها واخسر الفقرا من امل الغنى ولهج به ان المتشبه منكم بالغنى مع امتناع مواده يشاكل الوارم يرى البعيد و رمه ويتوهمه خصبا لبدنه من حسن قوته و تمكن صحته وصاحبه يجد المه ومن قرب منه وفتش عنه يعلم انه منه فى علة مبرحة به ان ايام الغنى محصلة عليه فكلما زادت زاد جرحه و يضاعف وزره و نسى ما به الحاجة اليه * وان ايام الفقير يغوى فيها صبره ويزيد حنكته و يتضاعف اجره استحيت من شكر الفقير الصابر سحلى ما يذوبه و عجت الارض من تسخط الغنى لتاخر ما فضل عن حاجته وحلم الله عزوجل ساتر والى مالك السراير المجازاة عليها و السلام الكامل على الصابرين. الى اوان لقايه تم السقر الخامس *

A second series of experiments to ascertain the mean quantity of Silt held in suspension by the waters of the Hooghly in various months of the year : as also the quantity carried out to sea. With an Appendix on its sectional Area and average discharge.—By Henry Piddington, *Curator Museum Economic Geology.*

It will perhaps be recollected by the readers of the Journal that at the close of my former notice on this highly interesting geological and physical problem, (Journal, Vol. XXIII. p. 283,) I recorded there Major (now Lieut.-Col.) Baker's remark, that the water at the surface would hold a less, as that at the bottom would hold a greater proportion of silt in suspension than the true mean amount, and I announced then that I had contrived a simple method of obtaining water at small depths.

This is, simply, a bottle attached mouth downwards to one side of a double line, near the bight, at which there is a leaden sinker ; so that when the bottle is lowered by that side of the line, the sinker carries it down, mouth downwards, and the air within the bottle prevents any great quantity of water from being forced in, while being lowered to the required depth (in this case 3 fathoms or 18 feet). The other side of the line, hitherto left slack, is then hauled upon, and the bottle thus being reversed fills quickly with water and is hauled up. This is of course not as strictly accurate as a more complex contrivance would be, but it is sufficiently so for all practical purposes. I may add that all the water at Calcutta for the whole year was taken up by myself about sunrise, on the dates which will be found prefixed to each month. I am not always at liberty on any fixed day, or the weather was sometimes unfavourable during the rains, so that the intervals are not exactly months. As before, the time of tide has been wholly disregarded to obtain a good average. In the few months during which the bottles of water were kept, no deposit of carbonate of lime, except slightly in one or two months, took place. The following was the process followed to obtain the results. It is one quite familiar in all details to chemists, but may be useful or of interest to those who not being practical chemists might desire to repeat our experiments on the water of other rivers.

1. The water was filtered and accurately measured, a small allowance being made for that retained by the filters.

2. The filters were double, both were carefully dried at about 100° Faht. and that containing the solid matter weighed, the other placed to counterbalance it in the opposite scale, so that the weight of the silt only was taken.

3. The deposit was tested for carbonate of lime by putting a minute portion into a watch glass with acetic acid, when the effervescence would be immediately perceptible.

4. The filtered water was slightly alkalised by ammonia to neutralise the superabundant carbonic acid, and the lime being precipitated by oxalate of ammonia was obtained as an oxalate, for which the equivalent quantity of carbonate of lime is set down. The whole of the filters for twelve months were then burnt, and the carbonate of lime being converted into the dry sulphate, the remainder was estimated as magnesia, with a trace of iron. This amounted for the twelve months, at the surface, to 3.05 grs. or 0.254 of magnesia per month; and at the 3 fs. depth to 3.75 grs. or 0.312 of magnesia per month; a quantity too small to deserve notice, were it not for the remarkable contrast which the estuary waters at the Gasper channel will be seen to afford. The whole is set down as carbonate of lime, and this difference is referred to in a note at the foot of the tables, which are as follows:

Table I.

Tabular statement of the amount of silt held in suspension by the surface water of the Hooghly, at Calcutta, for each month, April, 1854 *to March,* 1855.

No.	Date.	Quantity of water.	Solid earthy matter.	Carbonate of lime in water.	Total of solid matter, silt and lime.	Lime found in the solid matter only.
	1854.	oz.	grs. silt.	grs.	grs.	
1	3rd April, ...	22.70	0.50	3.92	4.42	
2	4th May, ...	21.80	0.60	1.52	2.12	
3	5th June, ...	30.00	0.60	2.61	3.21	Trace.
4	4th July, ...	23.75	4.25	0.58	4.83	
5	5th August, ...	23.80	11.75	0.32	12.07	
6	1st September, ..	23.60	4.00	1.17	5.17	Trace.
7	1st October, ...	23.20	2.88	1.44	4.32	
8	4th November, ..	22.00	1.20	0.59	1.79	
9	1st December, ..	25.00	4.20	1.35	5.55	
	1855.					
10	10th January, ..	25.50	3.65	0.47	4.12	
11	3rd February, ..	24.00	5.25	1.95	7.20	
12	8th March,.....	24.30	0.75	1.75	2.50	
	Totals,..	289.65	39.63	17.67	57.30	
	Means,..	24.14	3.30	1.47*	4.77	

* Less magnesia 0.254 per month.

TABLE II.

Tabular statement of the amount of silt held in suspension at a mean depth of 3 fathoms by the water of the Hooghly, at Calcutta, for each month, April, 1854 to March, 1855.

No.	Date.	Quantity of water.	Solid earthy matters (silt).	Carbonate of lime in water.	Total of solid matters, silt and lime.	Lime in the solid matter only.
	1854.	Oz.	grs.	grs.	grs.	grs.
1	3rd April, ...	22.60	8.70	1.60	10.30	0.15
2	4th May, ...	23.80	6 25	1.00	7.25	Trace.
3	5th June, ...	21.20	1.30	3.12	4.42	0.00
4	4th July,.....	22.50	6.50	1.00	7.50	0.00
5	7th August, ...	23.50	13.30	0.08	13.38	Trace.
6	1st September, ..	24.50	7.62	1.10	8.72	Trace.
7	1st October, ...	26.00	7.00	0.72	7.72	0.00
8	4th November, ..	26.00	2.60	0.89	3.49	0.00
9	1st December, ..	22.50	1.60	0.75	2.35	0.00
	1855.					
10	2nd January, ...	24.00	2.36	2.60	4.96	0.00
11	3rd February, ..	23.80	8 50	1.18	9.68	1.00
12	8th March,.....	24.00	6.50	1.76	8.26	0 00
	Totals,..	284.40	72.23	15.80	88.03	1.15
	Means,..	23.70	6.02	1.32*	7.34	0.09

Before giving the results of the examination of the waters at the Gasper Floating Light Vessel it may be as well to remark on the results now obtained in comparison with those shewn in my first paper. To save the trouble of reference I set down here the mean results of each column from both examinations.

Per month.	Surface water, in 1842.	Surface water, in 1854-55.	Water at 3 fs. depth in 1854-55.
	oz.	oz.	oz.
Mean Quantity of Water, ...	25.$\frac{1}{3}$	24.14	23.70
Solid earthy matter, silt,..	6 04	3.30	6.02
Carbonate of Lime in water,	7.95	1.47	1.32
Total of solid matter, i. e.			
Silt and Lime,..	13.99	4.77	7.34

* Less magnesia 0.312 per month.

It would thus appear that either there are very extraordinary differences in the amount of silt and of lime in different years, or that some errors exist somewhere. The fall of rain at Calcutta for the whole year in 1842 was 76.14 inches, and from April 1854 to March 1855, 65.89 inches only; or 10.25 in. or 13.33 per cent. less; and this may partly, if not entirely, account for the deficiency? Another, and a probable source of error was that, in 1842 I did not take up the water myself, but giving *more* pice to a good peon than the boat hire would amount to, I sent him to obtain a bottle full of water, strictly charging him to do so from the middle of the river. But as usual where we fancy we employ a trustworthy native it was not improbable that I might have been deceived, and I at first supposed that the peon, to pocket the whole of the pice, just took up water close to the shore by stepping into a boat at the ghaut; and this would account for the larger quantity of silt shewn, but not at all for the very large quantity of carbonate of lime in 1842, which as related in my former paper formed crusts on the side and even stalactitic incrustations at the bottoms of the bottles; so that about this—to say nothing of the impossibility of any practical chemist making any mistake as to carbonate of lime—there can be no question.

To clear up this doubt if possible, I took up on the 16th of November a bottle of water in mid channel opposite to the Governor General's Ghât (half way between Chaundpaul Ghât and Fort Point) and another bottle at not more than 20 yards from the shore. This was about at half or three quarters flood.

When examined for silt and carbonate of lime, the results were found to be, for the same measure of water.

	Solid matter.	Carbonate lime.
In mid channel, ...	1.36	1.52
At 20 yards from the shore, ...	0.75	2.00

Hence we see, that the silt is less in shore, though the proportion of lime is twenty-five per cent. more than in mid-stream. In 1842, the table in my former paper gives for November, silt 2.12 and carbonate of lime 7.88, so that it is in this last constituent that the great discrepancy exists, and we can only attribute it to the heavier

fall of rain, and thence perhaps the higher rise of the great Ganges pouring in a larger quantity of calcareous matter.*

We must therefore I think in fairness, *and for the present*, take a mean between the surface water of 1842, and that taken at 3 fathoms depth in 1854-55 for about the mean quantity of silt held in suspension by the Hooghly for a series of years ? though it seems clear that nothing but water taken up at Nuddea where the Bhaghirutty, Jellinghee and Matabangah, the three off-shoots from the great Ganges which form the river Hooghly, meet, and where the influence of the tides is not felt, can give us the true quantity of silt and carbonate of lime brought down ; and again that this must be done for a series of years to obtain a really good average.†

The means above proposed would be as follows :

	Water. oz.	Solid earthy matter silt.	Carbonate lime in water.	Total solid (silt and lime).
1842, ... Mean, ...	25.$\frac{3}{5}$	6.04	7.95	13.99
1854-55 at 3 fs. depth, Mean, ...	23.70	6.02	1.32	7.34
	49.03	12.06	9.27	21.33
Mean of both series, ...	24.51	6.03	4.63	10.66

Now with the same data then as in my former paper, i. e. 1.73296 inches to the cubic (apothecary's) ounce of water, the above average quantity of water 24.51 oz. will be equal to 42.47385 cubic inches which, to save decimals, we will call 42.48 cubic inches of water containing 6.03 grs. of silt and 4.63 grs. of lime, which for a cubic

* With which its waters are always charged, the lime depositing so fast when the river lowers that it forms beds of *kunkur*, (impure limestone) which are often serious obstructions to the navigation of the river.

† The Indigo Planters are well aware of, and often suffer from the caprices of the river in this matter of more or less silt (called by them *Polay*, see Researches Vol. XVIII. part II.) being deposited by the river on their inundated lands, where it sometimes leaves them a rich bed of it for their next year's crop, and at another barely enough to cover the old vegetation. We also see at the sections of the river banks that the laminæ of silt are of varying thicknesses.

foot of water will give 433.63 grs. or nearly $\frac{9}{10}$ths (nine-tenths) of an ounce for the whole solid contents of the cubic foot of water.

The proportion of carbonate of lime to the total of solid matter is also less, for in 1842 of the 13.99 grains of solid matter, 7.95 were carbonate of lime, which proportion should give 6.06 for the 10.66 grains of solid matter of 1854-55, whereas we find it to be 4.63 only, or one-third less.

Again: in 1842, the four months of March, April, May and June were those in which the largest amount of sediment was brought down whereas in 1854-55 the four months of July, August, September and October give the largest amount of solid matter; which is, for the whole year, as 7.34 only to 13.99 in 1842 and for the four heaviest months as follows.

	In 1842.	In 1854 55.
Average quantity of water in the four heaviest months,..	by former paper 25.50 oz. or 44.19 cubic inches.	at 3 fs. depth. 24.12 oz. or 41.80 cubic inches.
of silt, ...	24.77 grs.	7.83
of carb. lime, ...	13.56 grs.	0.72
of silt in each cubic foot of water, ...	1678.92 grs.	353.46 grs.

which last (i. e. the 353.46 grs.) are equal to 0.8366 cubic inches or $\frac{1}{2072}$ one two thousand and seventy-second part of its bulk; of which however only about $\frac{1}{12}$th is carbonate of lime.

The cubic inch of the dry solid silt, as deposited, I shewed in my former paper to weigh about 424 grains. To this our present result 433.63 grains to a cubic foot of water (see page 156) is so near an approach that we may take it as the average, and in round numbers say, for facility of recollection, that every cubic foot of water contains a cubic inch of silt; or more exactly in fractions, not $\frac{1}{1333}$, one thirteen hundred and thirty-third, part of its bulk of silt, as before found for 1842, but $\frac{1}{1728}$th (one seventeen hundred and twenty-eighth part.) This is still, however, an enormous proportion when we recollect the mass of water discharged by the Hooghly alone, which Mr. Bedford, the late River Surveyor, by careful sectional measurement calculates as follows at Moyapore, which is thirteen miles below Calcutta.

	Feet.
Mean depth, ...	29.102
Mean velocity per second,..	35.562
Discharge per second in gallons, (Imp. measure ?)	3.214.758
Which is in Cubic feet, H. P., ...	507.060
Col. Goodwin estimates the discharge at Calcutta to be per second, Cubic feet, ...	444.960
At one inch of solid matter for every cubic foot of water, this would give, for the Moyapore average, per second, cubic feet of silt,..	$298.\frac{894}{1728}$
For the Calcutta average, cubic feet of silt, ...	$257.\frac{894}{1728}$
The mean of these two we may call in round numbers Cubic feet per second, of silt, ...	278.
Or per hour, Cubic feet of silt, ...	1.000.800
Or per day Cubic feet, ...	24,019,200

* I copy the following from the work of Mr. Charles Ellet, Junr. "On the Inundations of the Mississippi and Ohio Rivers," (p. 173) published in 1853.

"The quantities of earthy matter contained in the water of the Mississippi in different conditions of its surface, have been investigated by several scientific gentlemen, whose results are not widely different. Preference is here given, however, to those published by Professor Riddell, of New Orleans, who, to his scientific reputation and skill as a manipulator, has superadded the claim to confidence which is due to great zeal in this subject.

"The experiments of Professor Riddell have led to the conclusion, that the proportion of sedimentary matter to the weight of Mississippi water containing it, is as follows.

Water 1 ; maximum weight of sediment $\frac{1}{693}$

Water 1 ; mean weight of sediment $\frac{1}{1153}$

Water 1 ; minimum weight of sediment $\frac{1}{2310}$

"When solidified into coherent earth, at a mean, it was found that the bulk of the sediment was equal to the $\frac{1}{3000}$ part of that of the water in which it was suspended.

"But the greatest amount of sediment is found when the river is in flood; and it is when in that condition that the discharge into the lake would take place. We may assume, therefore, from these experiments, that when there is a great flood in the river, the bulk of sediment would be to that of the water containing it, about as 1 to 1800."

Water at the GASPER *Floating Light.*

To unprofessional readers, it may be as well to state that the *Gasper* Floating Light Vessel is moored a few miles below the South point of Saugor Island and 26 miles to the Northward and Westward of the Outer Floating Light Vessel; so that the *Gasper* station is exactly where the last traces of the suspended silt of the river may be supposed to reach; though as lying upwards of 30 miles up amongst the sands which form the Sandheads of the Hooghly, it cannot be said to be, like the Outer Floating Light, almost in the open ocean; so that it is the fairest available spot at which to form an estimate of how much of the silt is carried down to the sea by the action of the surface water, for there is no doubt some action, probably a returning one, going on at the bottom, of which we are unable to form any estimate. It will be noticed that February is but an average from the preceding months, as no water taken in that month reached me. I am indebted to Mr. Parker, H. C. S., Chief Officer of the Star F. L. for this valuable series.

The following was the process adopted:

1. The water was first filtered to obtain the silt as before.

2. It was then evaporated to dryness and re-dissolved in a small quantity of water to obtain the sulphate of lime, no account being taken of the very little taken up by the water of solution.

3. Bi-carbonate of ammonia being added to the solution, threw down as carbonate of lime what had existed as a muriate, leaving the magnesia in solution.

4. The magnesia was precipitated by the phosphate of soda and the Ammonia-phosphate of magnesia was calcined to a red heat and the magnesia deduced from it.

To check the results again, the filters were burnt and the weight of the whole taken, with due allowance for the weight of ash of the filters.

For the solid matter; the net weight after combustion was for

the 11 months,	17.75
By the table it is,	18.05
Difference only,	00.30

which is too small to notice being only .03 or three-hundredths of a grain per month.

The amount of magnesia was also checked by re-converting the phosphate of magnesia into the carbonate; and although the average of 7.60 grains in 24.89 oz. of the water may appear large, I found that water taken from the middle of the Bay of Bengal* gave for $23\frac{3}{4}$ ounces of water as follows:

	Middle of Bay.	*Gasper Channel, Decr.*
Water,..	$23\frac{3}{4}$ oz.	26.00 oz.
Mur. Soda, ...	263.25 grs.	148.75 grs.
Magnesia, ...	8.09	7.04
Insoluble salts, sulphate and carbonate of lime,‡	6.50	8.75

The following table will give at one view, the results of the eleven months for which I obtained water.

TABLE III.

Tabular statement of the amount of silt and of earthy salts held in suspension at the mouth of the Hooghly below Saugor; at a mean depth from $2\frac{1}{2}$ *to* 3 *fathoms, at the* GASPER CHANNEL *Floating Light Vessel, in Lat.* 21° 26′ *N.; Long.* 88° 04′ *East.*

No.	Date.	Quantity of water.	Solid earthy matter (silt).	Carbonate of lime in water.	Sulphate of lime and ox. of iron.	Magnesia.	Total of solid matter; silt and solution.	Lime in the silt.	Remarks.
	1854.	oz.	grs	grs.	grs				
1	1st March,....	24.50	0.50	8 40	0.40	12.	21.30	0.00	
2	15th April,....	24 00	3.50	5 20	2.50	7.90	19 50	0.00	
3	1st May, ...	24.30	1.25	4.45	5.60	2.54	13 84	1.25	
4	15th June, ...	24.50	1.00	9 50	4 25	14.48	30.23	1.00	
5	15th July, ...	26.00	1.00	6 50	1 12	4 20	12.82	1 00	
6	24th August,..	22 50	2 75	3.50	0 60	6 76	15.01	2 75	
7	1st September,	25.50	1.00	7 60	3.25	3 30	15.15	1.00	
8	4th October. ..	25 20	2.25	10.25	0 50	4.60	18 10	0.00	
9	1st November,	24.75	2 75	4 00	0.75	4.58	12 08	0.00	
10	2nd December, 1855.	26.00	1.50	7.00	1.75	7.04	17 29	0 00	
11	1st January, ..	26.50	1.15	9 90	1.60	10 20	22.85	0.00	
12	1st February,†	24.89	1.69	6 94	2.03	7.60	18.92	0.64	
	Total,..	298.64	20.34	83.	24 35	86 20	217.09	7.64	
	Means,..	24 89	1 69	6.94‡	2 03	7.60	18.92	0 64	

* Of which I happened to have a bottle sent me by a friend some years ago.
† Average only from preceding 11 months.
‡ In solution this is of course a muriate.

Comparing now the results of our estimated mean average at Calcutta as given at p. 156 with these at the Gasper, we find them as follows.

	Water, oz.	Solid earthy matter silt.	Carbonate of lime.	Magnesia.	Sulphate of lime and iron.	Total of solid matter in water; silt and solution.
Calcutta, ...	24.51	6.03	4.63	0.00	0.00	10.66
Gasper channel,	24.89	1.69	6.94	7.60	2.03	18.92

So that we find that three-fourths of the more earthy detritus is already dispersed by being diluted by the water of the ocean, and indeed if the whole were to be deposited the river channels would quickly be choked up, and that the sea water has largely added magnesia as an element to the salts in solution; for the river water at Calcutta which always contains a sufficiency of lime shews, as will be observed (p. 153), only a trace of magnesia as the *kunkurs* are found to do.

I thought it well worth while also, to know what is really the time which the whole of the sediment in the water takes to settle, and I found that the silt of the surface water of the Hooghly, in the month of November, took exactly nine days to sink through one foot of water in a cylindrical glass vessel! this rate would give fifty-four days for a single fathom! and in salt or brackish water the rate would be still slower from its greater density; and this accounts for the finer sediment being carried so far out to sea, and for the slow rate of decrease of soundings in the sea channels and on the Sand Heads or ridges which extend along the head of the Delta.

Postscript.

In connection with this research, and as affording us some little light as to the processes going on in the river, I may here mention that I have been favoured by Mr. Bensley, H. C. Pilot Service, now the river-surveyor, with two very interesting specimens; being a *kunkur* now forming on the beach at Kedgeree and some dredgings from Lloyd's Channel which is between Kedgeree and Saugor roads, I describe them in the order in which I have mentioned them.

Kunkur from the beach at Kedgeree.

This is a true *kunkur** as to external form, and may at a little distance be easily mistaken for one of the common iron laterites, to which indeed it in some measure approaches; for singular to say it contains a mere fraction of two or three per cent. of lime! and is in fact a loose and coarse-grained, siliceous sandstone *kunkur*, of which oxide of iron and not lime forms the cohesive element. When we recollect that this is in progress of formation on the shore of the estuary of a river, the waters of which are abundantly charged with lime and the tidal water, with magnesia, while the oxide of iron forms a mere trace in it, it is certainly a most singular Geological fact and one which may give rise to many speculations. For the present I only note it and that a fair average of it gave in 100 parts as follows.

Earthy Silicates,	84.75
Carbonate of Lime,	2.50
Carbonate of Magnesia,	0.61
Peroxide of Iron,	12.00
	99.86
Loss,	0.14
Total,	100.00

Dredgings from Lloyd's Channel.

These are principally a fine micaceous sand which gives but a very little effervescence, and thus contains but an exceeding small proportion of carbonate of lime. It separated naturally in the bottle into two parts, of which the lower one was the sand above described, and the upper one a black fœtid mud; so strongly impregnated with sulphuretted hydrogen, that it immediately and strongly discoloured silver foil placed in it, thus shewing that the vast amount of decomposing animal matter of which the Hooghly is, we know, made the receptacle, is by a wise provision of nature, so to say, imprisoned beneath the waters! where it doubtless serves as food for millions of the inferior animals.

* Using the word in the native sense, *konkra*, any thing rough, jagged or puckered; for it is applied both to concretionary limestone and also to the ferruginous concretions usually called by us Laterite.

APPENDIX.

I give the following data, which are all useful elements of the great problem of our yet unknown river, in the form of an Appendix because the researches are not my own, and because it is right that full justice should be done to the valuable labours of the gentlemen, to whom we owe them; for none but those who have been engaged in these pursuits can form any idea of the careful, and minute, and laborious details which are expressed in the few figures of the table below:—

Observers, and place and time of observation.	Width of River.	Mean depth.	Sectional area.	Mean velocity per second.	Discharge per second.
	Feet.	Feet.	Sq. feet.	Feet.	Cubic feet.
Lt. Col. Goodwyn, B. E. at Calcutta. Clive Street Ghat to Howrah, in March, .	2.060	36.0	74,160	4.5	444,960
A. Bedford, Esq. H. C. S. River Surveyor. At Moyapore 13 miles below Calcutta, March, 1854, ...	3.300 (nearly)	29′ 10″ 2	..	2.88	507,060 (H. P.)
A. Bedford, Esq. at Jiggerkolly Semaphore, below Diamond Point and N. W. b. W. $2\frac{3}{4}$′ from Culpee Pagoda, in March, 1854,*.....	8,800	32′ 1″ 4	..	4.596	1,277,009 (H. P.)
Averages of the Mississippi River as given in Mr. Ellet's work.....	3.300 (p. 30)	115.0 (p. 33)	200,000 (p. 34)	Surface 7.00 (p. 36)	979.240 below New Orleans (p. 41)

Col. Goodwyn and Mr. Bedford give also the following notes with these results, which as they could not be conveniently tabulated, I set down here.

Colonel Goodwyn.

1. Fall of the river bed about 4″ per mile.
2. The mean volocity above given, $\frac{4}{5}$ths that of the surface.

* And below the point where the Dummooda and Roopnarain join the Hooghly. The flood tide from the sea much augments the volume of water here, so that the discharge shewn is that of the whole tidal water of the estuary rather than that of the river.

3. As the velocities increase with the depths, there will be a much greater discharge during the freshes.

Mr. Bedford.

At Jiggerkolly.

1. Mean level above Zero (of the tide guage, see below) 7 feet 1.3 inch.

2. Velocity per second, in inches at surface, is 62,57; at bottom 47,747. Mean (as in table) 55,159.

At Moyapore.

1. Mean level above Zero 8 feet 9.4 inches.

2. Surface velocity in inches 40,42; at bottom 28,704. Mean as in table 34,562.

3. The mean level above Zero is the mean of all the Registers taken every quarter of an hour on a guage, the Zero of which was on the same absolute level as the Zero of the Tide-guage at the old Kidderpore Docks.

4. The mean depth is the mean of all the perpendicular co-ordinates of the section taken at every 100 feet from the above mean level to the bed of the river.

5. The velocity at the surface in inches is the mean of the velocities taken every quarter of an hour from high water.

6. The velocity at the bottom is taken from the usual formula tables (De Buat's.)

7. The fall of the ebb tide between Calcutta and Jiggerkolly was about 6 feet 6 inches in the whole distance, which is about 68 geographical miles of 2028 yards each.

8. The foregoing two sets of observations for the discharge were taken at Jiggerkolly on the 16th March, and at Moyapore on the 29th March, 1854. The range of tide at Calcutta on these two dates differed but 3 inches, being so much in excess on the 29th March.

Memorandum.—Mr. Bedford's note giving the discharge in gallons, I have assumed that *Imperial* gallons of 277,274 cubic inches are intended, and have thus allowed 6.34 gallons to the cubic foot in converting his numbers to suit our table.—H. P.

THE SAKPHA of TIBET, SACFA HODGSONIÆ NOBIS

On a new Perdicine bird from Tibet.—By B. H. Hodgson, *Esq.*

To General Jung Bahadoor, prime minister of Nepal, I am indebted for the gift of a fine sample, of what appears to me decidedly a new species, and probably also a new type, of the partridge group of birds. The General in his recent military expedition into Tibet procured the bird alive. But it died at Kathmandu and he sent me the spoils, in very fine condition.

Perdicinæ.

Genus Sacfa *mihi.*

Sakpha of the Tibetans.

S. Hodgsoniæ* *mihi.*

The essential characters of the genus or subgenus are as follows:

Bill, strong with a heavy overlying upper mandible, scarped along the cutting edges. Nares subvertical and opening towards the head. Wings and tail longer, and less bowed and gradated, and stronger than in Perdix; but not so long or acuminate as in Lerva, and about equal to Francolinus.

Wings with 3-4-5, quills longest and nearly equal, 1-2 not much gradated: 1st, only $\frac{1}{2}$ inch less than the longest.

Tail 16, rounded, firm.

Tarsi moderate, equal to the longest toe and nail, nude, biscaled in front, no spur?

Lateral toes subequal and furnished with the usual basal membrane. Nails blunt, scooped inferiorly and having a salient margin all round. Orbits subnude, as in Arboricola.

This fine species is denominated Sakpha by the Tibetans. It was obtained in the western part of the province of Tsang. I know nothing of its habits. My sample is a female and therefore the peculiar character of the bill, in this sex very marked, must be more so in the males, and resembles, in fact, that organ in Lophophorus, or the monâl. For the same reason, that is, my sample being a female, I am doubtful as to the presence or absence of

* I take the liberty of dedicating this handsome species to Mrs. Hodgson, whose accurate and tasteful delineations of Himalayan scenery will do much to attract attention to this fine field for scientific research.

the spur on the legs. But it is probably absent or but slightly developed.

The other members have been sufficiently described in the generic character.

The colours are as follows:

Bill and legs, horn green. Orbital skin, reddish. Above transversely marked with black, rufous and chesnut, in frequent bars, the black being more developed on the wings, and the chesnut on the flanks, where indeed the black nearly disappears, while on the belly, it is so much developed as to constitute the main and almost only colour. Neck, above and laterally, and all the lateral tail feathers, full unmarked chesnut: cheeks, throat and breast, luteous or albescent buff. A black zone round the throat from the cap, and a black patch below the eye.

The size is as follows:

Tip of bill to tip of tail, ...	1.1.0
Expanse of wings, ...	1.6.0
A closed wing, ...	0.6.$\frac{1}{8}$
Bill to gape, ...	0.0.$\frac{7}{8}$
Bill to brow, ...	0.0.$\frac{3}{4}$
Tail, ...	0.4.0
Tarse, ...	0.1.$\frac{3}{4}$
Central toe and nail, ...	0.1.$\frac{1}{2}$

Weight 1 lb.

In conclusion I may remark that the bird has much of the character of Caccabis, whilst in colours it resembles greatly the grey partridge of India, without however, losing certain Caccabine traits which the expert will at once detect on turning to the accompanying beautiful drawing, the work of my native artist.*

Darjiling, Sept. 1855.

* It most nearly approximates in type to *Perdix cinerea*.—Cur. As. Soc.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

FOR FEBRUARY, 1856.

At a monthly general meeting of the Society held on the 6th inst. Sir J. W. COLVILE, Kt. President, in the chair.

The minutes of the December meeting having been read and confirmed, it was resolved on the motion of the President, seconded by Mr. Grote,

"That so much of the proceedings just read between the words, 'and sanctioned' and 'Captain Thuillier' be not published as part of the proceedings of the Society."

Presentations were received—

1. From Captaiu Fairweather, two Abyssinian smoking pipes.

2. From Capt. Shute, ship *Sultany*, an old wooden quadrant and a meridian instrument found in the island of Madagascar. The instruments are supposed to have been in use by Nacodas about one hundred years ago.

3. From the Right Rev. the Bishop of Victoria, a copy of St. Luke's Gospel in Japanese, recently printed from wooden blocks in St. Paul's College, Hongkong.

4. From the Right Hon'ble the Governor in Council at Bombay through Lieut. E. T. Fergusson, Superintendent of Government Observatory, a copy of the Magnetical and Meteorological Observations made at the Bombay Observatory iu 1853.

5. From the Government of the N. W. Provinces, seventeen gold coins found in the Gurruckpore district, with a request that the Society would select such as it required for the Museum.

The coins are of the Canouj series of the reigns of Chandra and Kumara Guptas.

Ordered that the Council be requested to make a selection.

6. T. Deveria, Esq. of Rungpore, on the part of his nephew M. S. Deveria, of the Egyptian Museum, Louvre, a copy of Noub la Déesse d' or des Egyptiens.

7. From Professor T. Oldham, Supt. Geological Survey, eight boxes of specimens, consisting principally of fossils and rocks from the Tenasserim Provinces, coal from the Irrawaddy river, and some old coins found on the site of the town of Tenasserim in the district of Mergui. The coins are undescribed, but appear to be allied to the symbolical coins of Arracan, noticed in XV. Vol. of the Society's Journal, p. 238.

8. From R. Hamilton, Esq. The Annual Report of the Ethnological Society of London for the year 1854.

9. From the Rev. S. Hislop, a large collection of fossils from Central India.

The following gentlemen duly proposed and seconded at the December meeting, were balloted for and elected ordinary members.

R. H. Russell, Esq. B. C. S. Chittagong.

Dr. G. B. Liebig, Presidency College, Calcutta.

Col. Smith, Madras Engineer.

J. W. B. Money, Esq.

The following candidates for election were named for ballot at the next meeting.

Bábu Rájendralál Mittra, proposed by A. Grote, Esq. and seconded by Sir J. W. Colvile.

Major R. R. W. Ellis, 23rd Regt. B. N. I. Political Assistant, Bundlekund, proposed by Dr. Spilsbury and seconded by Dr. Thomson.

J. F. Curtis, Esq. proposed by Mr. Atkinson and seconded by Mr. Grote.

The chairman announced to the meeting that Bábu Rájendralál Mittra had notified to the Council his resignation from the 1st proximo of the office of Assistant Secretary and Librarian to the Society, and, after paying a high compliment to the industry and ability of that valuable officer, stated that the Council had appointed a

Sub-Committee to consider what steps should be taken to supply the vacancy.

The Council submitted reports—

1. Recommending that the consideration of the proposal for reducing the rate of subscriptions be deferred until a Sub-Committee appointed by them to take the subject into consideration had submitted their report.

2. Announcing that they have appointed the following Sub-Committees.

Sub-Committee of Finance.

C. Allen, Esq., A. Grote, Esq. and C. Beadon, Esq.

Sub-Committee of Philology.

A. Grote, Esq., Lt. Lees, Rev. J. Long, G. G. Morris, Esq. and F. E. Hall, Esq.

Sub-Committee of Library.

Bábu Ramáprasad Roy, Dr. Walker, W. Grapel, Esq., A. Grote, Esq. and Lt. Lees.

Sub-Committee of Natural History.

Dr. G. G. Spilsbury, Dr. Walker, A. Grote, Esq., Dr. A. C. Macrae, Capt. C. B. Young, Dr. T. Boycott and Dr. Thomson.

Communications were received—

1. From Babu Radhanath Sikdar, communicating abstracts of Meteorological Observations taken at the Surveyor General's Office in August, September and October last.

2. From Mr. Assistant Secretary Carmichael, forwarding a copy of Meteorological Register kept at the office of the Secretary to the Government of the N. W. Provinces for the month of November, 1855.

3. From Mons. Hermann Schlagintweit, communicating some notes on the Hydrography of the Brahmaputra.

4. From Col. R. J. H. Birch, C. B., Secretary to the Government of India in the Military Department, enclosing a report on the progress of Mons. A. and R. Schlagintweit's researches in the Himalaya mountains, during the last season. The Secretary read to the meeting extracts from the report.

5. From A. Grote, Esq. forwarding, for exhibition to the meeting

a large meteorite weighing 14 ℔s. and the following note on the same by Dr. Evan McDonell.

"I was informed by a native on the 7th of March, 1853, that a shower of stones had fallen in the neighbourhood of Soojoulee on the preceding day at noon.

"I immediately sent a person to make enquiry as to the truth of what had been related to me. The person sent, returned the following morning and brought me three meteoric stones. He stated that many more had fallen, and had been picked up by other parties.

"In the meantime I met three of the Officers of the Irregular Cavalry at Soojoulee, who informed me that they had all remarked, and been much struck with the peculiar rumbling noise they had heard on the previous day at noon; it could not be mistaken for thunder, the sound being, as stated by them, totally different. An Italian priest stationed at Bettiah, seventeen miles West of Soojoulee, remarked the same kind of noise at the same hour, and he mentioned to me that all the natives around him were much alarmed, and the head "gooroo" of the Bettiah Rájá sent to ask him if he could explain what such strange sounds in the heavens portended. Another Italian missionary priest stationed six miles North-West of Bettiah, made the same remarks. The priest at Bettiah compared the noise to that of a heavy cart or waggon passing over a platform. The sounds were audible for forty seconds, the sky was cloudless and the sun shining brightly at the time. The wind was west and cool, the weather for some days previous to the 6th March was particularly cool. The Thermometer stood on the 4th, 5th and 6th at 44° at day-light. The number of meteoric stones which I know to have been picked up within a circle of a mile, amounts to at least thirty. The weight varied from ½ ℔ to 4 ℔s. and one weighed as much as 14½ ℔s. The shape in every instance was less or more pyramidal."

The Librarian and the Curator in the Zoological Department having submitted their usual monthly reports, the meeting adjourned.

Library.

The library has received the following additions during the months of December and January last.

Presented.

Die Lieder des Hafis, Persisch mit dem commentare des Sudi herausgegeben von Hermann Brockhaus, 1 ed. 2 heft.—By the Editor.

Half yearly Report of the Committee of the Bengal Chamber of Commerce, Calcutta, November, 1855.—By the Chamber.

Die Todtenbestattung bei den Brahmanen und die opfergebräuche im Veda, von Dr. Max Muller.—By the Author.

Noub la Déesse d'Or des Egyptiens par M. Th. Deveria, 8vo. pamphlet —By the Author.

Address to the Ethnological Society of London, delivered at the Annual Meeting on the 25th May, 1855, by J. Conolly, and a Sketch of the recent Progress of Ethnology, by R. Cull, Secretary, 8vo. pamphlet.—By R. Hamilton, Esq.

A Manual of Ethnological Enquiry; being a series of Questions concerning the Human Race, 8vo. pamphlet.—By the Same.

Selections from the Records of the Madras Government, No. III. The Navigation of the Godavery. No. XV. Reports on Important Public Works.—By the Government of Bengal.

Selections from the Records of the Bengal Government, No. XXII. On Vernacular Education, 2 copies.—By the Same.

Geographical and Statistical Report of the District of Beerbhoom, by Capt. Sherwill, Calcutta, 1855, 4to.—By the Same.

Notices of the Meetings of the Members of the Royal Institution of Great Britain. Part V.—By the Institution.

Magnetical and Meteorological Observations made at the Honorable East India Company's Observatory, Bombay, in the year 1853, under the Superintendence of Lt. E. F. J. Furgusson, Bombay, 1855, 4to.—By the Govt. of Bombay.

Report on the Government Central Museum, Madras, by E. Balfour, Esq. on the Iron Ores, the Manufacture of Iron and Steel, and the Coals of the Madras Presidency.—By the Madras Government.

Memoirs of the American Academy of Arts and Sciences, new series, vol V. p. I.—By the Academy.

A History of the Fishes of Massachusetts, by D. H. Slorer, 4to.—By the Author.

Recuiel des Actes de l'Académie imperiale des Sciences, Belles-Lettres et Arts de Bordeaux, 1854, 3 tremestre.—By the Academy.

Les Auteurs Hindustanis et les sons Ouvrages par M. Garcin de Tassy, *Paris*, 1855, 8vo.—By the Author.

The Durbin, a Persian newspaper, for December and January last.—By the Editor.

The Upadeshak, No. 109.—By the Editor.

The Oriental Christian Spectator, for January, 1856.—By the Editor.

The Oriental Baptist, No. 109.—By the Editor.

The Calcutta Christian Observer for January, 1856.—By the Editors.

Purchased.

Annuaire des Deux Mondes, Histoire General des divers Etats, 1854-55.

Revue des Deux Mondes 1st and 15th Oct. and 1st Nov.

Annales des Sciences Naturelles, Nos. 4 and 5 of 1855.

Revue et Magazin de Zoologie, No. 9, 1855.

Journal des Savants, Aut, Septembre et Octobre, 1855.

Comptes Rendus, No. 17, 22nd October, 1855.

L' Athenæum Français, Nos. 36 to 43.

The Athenæum, for October, 1855.

The Edinburgh Review, No. 208.

The Annals and Magazine of Natural History, for Oct. and Nov. 1855.

Vuller's Lexicon Persico-Latinum, Fasciculus IV.

Franklin's History of Shah Alum, *London*, 1798, 4to.

Trésor de Numismatique et de Glyptique, ou Recueil général de Médailles, Monnies, Pierres, Gravecs Bas-Reliefs, &c. tant anciens que modernes, les plus interessans sous le Rapport de l'Art et de l'Histoire, gravé par les procedes de M. Achille Collas, *Paris*, 1836, fol.

The Shekandárnámeh of Nizamy, 1 vol. 8vo. Persian.

A Commentary on the Gulistan, 4to. MS. ditto.

Nafhat ul Yaman, 1 vol. 4to. Arabic.

A Dictionary in Hindi and English by J. T. Thompson, Calcutta, 1846, Rl. 8vo.

Dow's History of Hindustan, 3 vols. 8vo.

Shareh Abul Fazl, 4to. Persian.

Intikháb Saudá, 4to. Urdu.

Tárikh Timuriá, 1 vol. 8vo. Arabic.

Waenen's Sententiæ Ali Ebn Abu Talib, *Oxon*, 1806, 4to.

Baillie's Arabic Grammar, 3 vols. demi 4to.

Euclid in Persian, 8vo.

Dastúr ul Amal, 8vo. Persian.

Shareh Múlla, 1 vol. 8vo. Arabic.

Baillie's Arabic Tables.

Shareh Bostán, 1 vol. 4to. Persian, Lithograph.

Bohtlingk's Vopadeva, 1 vol.

Viváda Chintamani, Sanskrit, 8vo.

Vopadeva's Mugdhabodha, *Serampur*, 1807, 12mo.

February 1st, 1856. Ra'jendrala'l Mittra.

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of August, 1855.

Maximum pressure observed at 9.50 A. M.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.089	84.9	85.4	78.4	S. W.	..	⌒ scattered.
2	29.135	85.5	85.5	78.2	N. W.	..	⌒ ditto.
3	29.081	86.3	86.4	78.4	S. W.	..	⌒ ditto.
4	29.047	86.9	86.9	78.5	W.	..	⌒ scattered in zen.
5	29.115	85.0	85.6	78.0	W.	..	Clear.
6	29.155	90.5	90.7	79.0	W.	..	⌒ a few to W.
7	29.139	88.9	89.4	78.4	W.	..	Clear.
8	29.117	89.0	89.6	78.9	N. W.	..	Ditto.
9	29.089	88.7	89.2	79.2	W.	..	⌒ scattered.
10	29.177	88.8	89.0	78.9	N. W.	..	⌒ ditto to E. S.
11	29.285	89.0	89.5	76.9	W.	..	Scattered to E.
12	29.253	90.7	92.5	78.5	N. W.	..	⌒ scattered.
13	29.189	88.5	88.8	76.0	N. W.	..	Clear.
14	29.265	89.0	89.6	77.5	N. W.	..	Ditto.
15	29.317	90.3	90.9	77.7	N. W.	..	Ditto.
16	29.319	91.0	92.0	76.6	W.	..	⌒ scattered in zen.
17	29.295	92.0	93.0	79.0	S. W.	..	⌒ scattered.
18	29.235	91.8	92.0	76.9	N. W.	..	⌒ ditto.
19	29.147	92.0	92.4	78.2	W.	..	Clear.
20	29.211	87.5	88.0	78.5	W.	..	⌒ scattered in zen.
21	29.209	89.9	90.2	78.9	S. W.	..	⌒ ditto.
22	29.193	89.5	90.5	77.0	S. W.	..	⌒ scattered towards [hor.
23	29.191	89.5	89.9	72.5	N. W.	..	⌒ scattered in zen.
24	29.205	92.6	93.5	73.8	N. W.	..	Clear.
25	29.241	92.5	92.5	76.2	N. W.	..	⌒ scattered in zen.
26	29.251	93.0	93.2	76.1	N. W.	..	Clear.
27	29.213	89.5	90.0	76.0	N. W.	..	⌒ scattered.
28	29.229	92.0	93.0	77.0	N. W.	..	Scattered.
29	29.271	93.6	94.5	77.4	N. W.	..	Clear.
30	29.291	92.0	92.5	81.0	E.	..	⌒ scattered all over.
31	29.281	91.0	91.6	82.8	E.	..	⌒ scattered.
Mean.	29.201	89.7	90.2	77.7			

Barometer Observations corrected for Capillarity only.

Symbols.
- \ Cirus.
- ⌒ Cirro strata.
- ⌒ Cumuli.
- ⌒ Cumulo strata.
- ⌒ Nimbi or Nimbus.

Note.—The dry bulb and maximum Register do not agree, the former always reads more than the latter. The average difference is 1.6.

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of August, 1855.

Observations at apparent Noon.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.103	87.9	87.9	80.6	S. W.	..	⌒ scattered.
2	29.127	88.0	88.5	79.1	W.	..	⌒ ditto.
3	29.065	88.9	88.9	78.2	S. W.	..	⌒ ditto.
4	29.025	89.9	90.0	80.0	N. W.	..	⌒ ditto.
5	29.085	86.5	87.9	78.5	W.	..	Clear.
6	29.135	91.5	92.0	80.0	W.	..	⌒ a few to W.
7	29.119	92.5	92.9	80.5	W.	..	∩ scattered in zen.
8	29.097	92.1	92.5	80.5	N. W.	..	Scattered in zen.
9	29.079	92.3	92.6	80.0	W.	..	⌒ scattered.
10	29.187	91.7	92.2	80.0	N. W.	..	⌒ all over.
11	29.275	92.8	93.3	79.0	S. W.	..	⌒ scattered.
12	29.247	93.5	93.8	78.4	S. W.	..	⌒ ditto.
13	29.179	90.0	91.6	78.0	N. W.	..	⌒ ditto.
14	29.251	92.0	92.8	77.7	N. W.	..	⌒ ditto.
15	29.307	92.9	94.2	78.4	N. W.	..	⌒ scattered in zen.
16	29.311	94.0	94.8	78.4	W.	..	⌒ ditto.
17	29.275	95.5	96.5	78.4	N. W.	..	⌒ scattered.
18	29.203	94.8	95.5	78.5	N. W.	..	∩ scattered in zen.
19	29.135	92.5	93.0	78.5	W.	..	⌒ ditto.
20	29.191	90.0	90.9	79.0	W.	..	∩ ditto.
21	29.187	90.9	90.5	81.4	S. W.	..	⌒ scattered.
22	29.179	92.8	93.7	78.4	N. W.	..	⌒ a few scattered.
23	29.173	92.5	92.9	73.1	N. W.	..	⌒ scattered in zen.
24	29.187	95.8	96.6	73.4	N. W.	..	Clear.
25	29.221	96.8	97.4	77.5	N. W.	..	Ditto.
26	29.227	97.1	97.5	76.8	N. W.	..	Ditto.
27	29.191	93.0	93.5	76.5	N. W.	..	⌒ scattered.
28	29.205	95.5	96.5	78.5	N. W.	..	∩ ditto.
29	29.247	97.0	98.0	79.4	N. W.	..	∩ scattered towards E.
30	29.267	94.0	94.8	82.0	E.	..	⌒ scattered all over.
31	29.247	94.9	95.2	81.5	E.	..	⌒ scattered.
Mean.	29.184	92.5	93.1	78.7			

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of August, 1855.

Minimum pressure observed at 4 P. M.

Date.	Barometer.	Temperature.			Maximum and minimum.			Aspect of the Sky.	Direction of Wind.	Quantity of Rain.
		Of Mercury.	Of Air.	Wet Bulb.	Maximum.	Minimum.	Mean.			
1	29.069	91.5	91.4	84.4	91.0	79.9	85.45	⌒ scattered.	S. W.	..
2	29.061	91.5	91.8	80.6	91.5	79.9	85.7	⌒ do. all over	W.	..
3	28.995	92.4	92.4	78.5	92.0	79.0	85.5	⌒ scattered.	W.	..
4	28.975	93.6	93.6	79.9	93.0	80.0	86.5	⌒ very few s.	W.	..
5	29.105	90.2	90.5	79.8	90.5	80.5	85.5	⌒ scattered.	N.	..
6	29.079	95.0	95.0	80.0	94.8	80.0	87.4	Clear.	W.	..
7	29.053	96.2	96.4	82.6	96.0	80.0	88.0	Ditto.	W.	..
8	29.033	96.8	96.6	80.8	96.5	81.5	89.0	⌒ scattered.	N. W.	..
9	29.027	93.0	93.0	79.0	95.0	81.0	88.0	⌒ s. all over.	W.	..
10	29.125	95.9	96.0	80.4	95.5	81.2	88.35	⌒ in genl.	W.	..
11	29.223	96.0	96.0	80.0	96.0	81.5	88.75	⌒ scattered.	W.	..
12	29.195	96.0	96.5	80.0	96.0	81.0	88.5	⌒ ditto.	S. W.	..
13	29.141	94.9	95.4	76.7	94.5	79.0	86.75	⌒ ditto. [W.	W.	0.25
14	29.195	95.0	95.0	79.0	95.5	79.0	87.25	⌒ towards N.	N. W.	..
15	29.231	96.9	96.0	79.0	97.3	81.0	89.15	⌒ scattered.	N. W.	..
16	29.225	98.2	98.4	79.9	98.0	83.0	90.5	⌒ ditto.	N. W.	..
17	29.177	97.8	99.4	80.5	98.0	83.8	90.9	⌒ ditto.	N. W.	..
18	29.121	98.0	97.5	80.8	97.8	83.5	90.65	⌒ ditto.	W.	..
19	29.083	96.0	96.8	79.9	96.0	82.0	89.0	⌒ ditto.	W.	..
20	29.155	93.5	94.0	80.0	94.5	82.0	88.25	⌒ ditto.	W.	..
21	29.111	93.8	93.1	80.2	92.6	83.5	88.05	⌒ ditto in zen.	N. W.	..
22	29.105	97.0	96.9	77.5	96.5	81.0	88.75	⌒ ditto.	N. W.	..
23	29.107	97.9	98.0	76.4	97.0	78.8	87.9	⌒ ditto in zen.	N. W.	..
24	29.123	100.5	100.5	78.0	100.0	80.5	90.25	⌒ a few s. in.	N. W.	..
25	29.158	101.8	101.4	76.5	101.0	83.4	92.2	Scattered in	N. W.	..
26	29.149	102.0	102.3	78.0	101.5	82.0	91.75	Clear. [zen.	N. W.	..
27	29.131	97.5	97.0	78.5	96.5	82.0	89.25	⌒ scattered.	N. W.	..
28	29.145	99.8	100.0	80.4	99.5	80.5	90.0	⌒ ditto.	W.	..
29	29.187	100.5	95.4	79.9	101.9	83.6	92.75	⌒ all over.	N. E.	..
30	29.177	91.5	88.5	83.1	97.0	83.5	90.25	⌒ s. all over.	N. E.	..
31	2.1 43	98.0	97.8	81.2	97.5	82.5	90.0	⌒ scattered.	E.	..
Mean.	29.119	96.0	95.9	79.6	96.1	81.2	88.70			0.25

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of September, 1855.

Maximum pressure observed at 9.50 A. M.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.249	92.9	93.2	80.2	E.	..	∼ scattered.
2	29.225	93.0	93.5	82.8	W.	..	∼ ditto to hor.
3	29.275	88.5	88.4	80.6	N. W.	..	_ scattered.
4	29.293	86.0	86.0	81.0	N. E.	..	≀ ditto.
5	29.303	88.9	88.5	82.9	S. E.	..	≀ ditto.
6	29.201	86.0	86.6	79.0	N.	..	≀ scattered all over.
7	29.237	85.0	85.2	78.4	N. E.	..	∼ scattered.
8	29.247	85.8	85.5	79.0	E.	0.30	≀ all over.
9	29.205	84.8	85.3	78.7	E.	0.37	∼ scattered.
10	29.203	85.9	86.5	78.3	E.	..	Clear.
11	29.217	79.8	78.4	76.9	N. E.	..	≀ all over.
12	29.241	82.8	83.0	77.8	N. W.	..	≀ scattered.
13	29.297	79.8	79.8	76.8	W.	..	≀ all over.
14	29.275	80.8	80.7	79.0	E.	6.62	Ditto.
15	29.303	81.9	82.5	78.5	S.	..	≀ scattered.
16	29.225	86.5	87.0	79.0	N.	..	Ditto.
17	29.251	82.0	82.1	78.9	N. E.	..	≀ all over.
18	29.219	81.8	81.5	79.2	N.	..	Ditto.
19	29.227	81.0	81.0	78.3	N.	..	≀ scattered.
20	29.245	83.0	83.0	76.5	W.	..	Clear.
21	29.339	83.5	83.4	76.9	N. W.	..	Ditto.
22	29.401	83.6	83.9	74.9	W.	..	Ditto.
23	29.345	85.0	85.0	77.6	N. W.	..	Ditto.
24	29.361	86.8	87.4	75.9	N. W.	..	∼ scattered in zen.
25	29.397	87.5	87.9	76.5	N.	..	Clear.
26	29.453	86.8	86.9	78.5	N. W.	..	∼ scattered in zen.
27	29.439	87.9	88.0	74.4	N. W.	..	Clear.
28	29.423	87.5	88.4	76.0	N. W.	..	Ditto.
29	29.443	86.5	87.0	74.4	N. W.	..	Ditto.
30	29.413	87.0	87.2	73.5	N. W.	..	Ditto.
Mean.	29.300	85.2	85.4	78.0		7.29	

Barometer Observations corrected for Capillarity only.

Symbols.
- \ Cirus.
- _ Cirro strata.
- ∩ Cumuli.
- ∼ Cumulo strata.
- ≀ Nimbi or Nimbus.

Note.—The dry bulb and maximum Register do not agree, the former always reads more than the latter. The average difference is 1.6.

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of September, 1855.

Observations at apparent Noon.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.203	25.6	95.9	79.4	E.	..	∩ scattered.
2	29.197	95.5	96.9	83.9	W.	..	∩ to hor.
3	29.253	90.0	90.5	82.4	N. W.	..	∿ scattered.
4	29.259	87.7	88.0	81.5	N. E.	..	Ditto.
5	29.205	91.8	92.0	82.0	S. E.	..	Ditto.
6	29.195	83.9	82.8	80.1	N.	0.30	∿ all over.
7	29.203	87.7	88.0	79.9	N. E.	..	∩ scattered.
8	29.229	87.9	88.0	79.4	E.	..	∿ ditto.
9	29.171	88.0	88.3	79.5	E.	..	∩ ditto.
10	29.209	87.3	88.2	79.2	E.	..	∩ scattered.
11	29.201	80.9	81.2	77.5	N. E.	..	∿ all over.
12	29.245	80.8	77.5	75.6	N. W.	0.32	Ditto.
13	29.285	82.0	82.2	78.2	W.	..	∿ scattered.
14	29.255	80.0	78.8	78.0	E.	0.32	∿ all over.
15	29.289	84.8	84.9	79.6	S.	..	∿ scattered.
16	29.201	89.6	90.0	79.5	N. E.	..	Ditto.
17	29.201	84.5	84.4	80.0	N. E.	..	Ditto.
18	29.195	84.5	84.5	80.5	N. E.	..	∿ all over.
19	29.185	84.0	84.0	78.3	N.	..	∿ scattered.
20	29.243	85.3	85.2	78.4	N. W.	..	Ditto.
21	29.331	85.9	85.9	79.5	N. W.	..	∩ scattered in zen.
22	29.387	86.0	86.5	77.3	W.	..	Clear.
23	29.331	88.9	89.5	78.5	N. W.	..	∩ scattered.
24	29.333	89.8	90.2	77.0	N. W.	..	Clear.
25	29.365	89.5	89.9	77.0	N.	..	Ditto.
26	29.417	89.5	89.5	77.0	N. W.	..	∩ scattered in zen.
27	29.419	91.0	91.5	74.9	N. W.	..	Clear.
28	29.403	90.9	91.5	76.0	N. W.	..	Ditto.
29	29.425	91.0	91.2	71.5	N. W.	..	Ditto.
30	29.373	91.5	91.6	74.0	N. W.	..	Ditto.
Mean.	29.274	87.5	87.6	78.8		0.94	

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of September, 1855.

Minimum pressure observed at 4 P. M.

Date.	Barometer.	Temperature.			Maximum and Minimum.			Aspect of the Sky.	Direction of Wind.	Quantity of Rain.	Total Rain.
		Of Mercury.	Of Air.	Wet Bulb.	Maximum.	Minimum.	Mean.				
1	29.117	99.9	99.1	79.4	99.5	83.8	91.65	⌒ scattered.	E.	..	..
2	29.105	95.0	95 0	80.5	97.0	83.0	90.0	⌒ ditto.	W.	..	..
3	29.127	94.0	94.0	82.0	94.5	75.5	85.0	⌒ ditto.	N. W.	..	..
4	29.155	92.0	92.0	82.5	92.5	79.8	86.15	⌒ to E.	N. E.	..	..
5	29.115	94.8	94.5	83.5	94.5	85.0	89.75	⌒ scattered.	E.	..	..
6	29.105	86.6	85.9	81.0	86.0	81.0	83.5	Ditto.	N. E.	..	..
7	29.121	91.9	91.5	80.9	91.6	77.0	84.3	⌒ ditto.	E.	..	..
8	29.149	91.0	90.8	80.5	91.0	81.0	86.0	⌒ ditto.	E.	..	..
9	29.129	90.9	90.6	80.0	91.8	77.8	84.8	⌒ all over.	E.	..	..
10	29.133	89.0	88.8	78.0	91.0	77.0	84.0	⌒towards S.E.	S. E.	..	..
11	29.109	79.0	79.0	77.2	80.7	75.0	77.85	⌒ all over.	N. W.	..	..
12	29.179	83.9	83.5	77.0	84.5	74.0	79.25	⌒ scattered.	N. W.	..	..
13	29.201	84.8	84.6	79.0	85.0	75.5	80.25	⌒ ditto.	W.	..	..
14	29.201	80.0	79.9	78.4	80.5	76.0	78.25	⌒ all over.	S. W.	..	..
15	29.217	87.8	88.1	81.9	88.0	76.0	82.0	⌒ scattered.	S.	..	..
16	29.173	83.0	80.5	78.4	92.0	79.0	85.5	⌒ all over.	N. E.	1.12	..
17	29.119	84.8	83.8	79.8	88.0	78.5	83.25	Ditto.	E.	0.07	..
18	29.135	78.0	76.5	75.9	84.5	77.0	80.75	⌒ ditto.	N. E.	2.17	..
19	29.127	87.9	87.5	79.5	88.0	75.5	81.75	⌒ scattered.	N. W.	..	..
20	29.171	86.9	86 3	79.5	87.5	76.0	81.7	⌒ toward	S. W.	..	..
21	29.273	89.0	88·9	80.2	90.0	76.5	83.25	⌒ scattered.	W.	..	..
22	29.313	90.5	90.4	80.5	90.5	75.0	82.75	Ditto.	W.	..	..
23	29.299	92.0	91.9	79.4	93.0	77.5	85.25	Ditto.	N.	..	..
24	29.261	98.2	93.2	77.9	94.0	79.5	86.75	⌒ ditto.	N. W.	..	..
25	29.295	93.5	93.5	78.0	93.5	77.5	85.5	Clear. [zen.	N.	..	..
26	29.347	93.8	93.6	77.0	93.5	77.5	85.5	⌒ scattered in	N. W.	..	..
27	29.361	94.5	94.0	76.0	94.5	77.0	85.75	Clear.	N. W.	..	..
28	29.337	94.8	94.4	78.0	94.5	77.0	85.75	Ditto.	N. W.	..	..
29	29.345	95.0	94.9	75.1	95.0	77.5	86.25	Ditto.	N. W.	..	..
30	29.305	95.2	95.0	95.0	95.5	76.5	86.0	Ditto.	N. W.	..	..
Mean.	29.200	89.4	89.3	79.7	90.7	77.8	84.28			3.36	10.69

Meteorological Register kept at the Offiee of the Secretary to Government, N. W. P., Agra, for the month of October, 1855.

Maximum pressure observed at 10 A. M.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.391	86.9	87.9	73.0	N.	..	Clear.
2	29.419	86.9	87.5	73.5	N.	..	Ditto.
3	29.429	88.8	88.4	75.0	N. W.	..	Ditto.
4	29.391	88.7	89.3	71.9	N. W.	..	Ditto.
5	29.375	84.8	85.1	69.5	N. W.	..	Ditto.
6	29.447	84.0	84.0	69.8	S. W.	..	Ditto.
7	29.463	89.0	91.0	70.0	N. W.	..	⌒ scattered in zen.
8	29.519	84.0	84.4	70.0	W.	..	Clear.
9	29.475	82.9	83.2	70.0	S. W.	..	Ditto.
10	29.463	83.9	84.9	70.1	N. W.	..	Ditto.
11	29.463	83.8	84.5	69.0	S. W.	..	Ditto.
12	29.435	85.6	86.5	70.8	S. W.	..	Ditto.
13	29.467	84.8	86.0	71.0	N.	..	Ditto.
14	29.455	82.5	83.0	69.7	N. W.	..	Ditto.
15	29.487	82.8	83.2	71.0	W.	..	Ditto.
16	29.471	83.0	84.0	72.5	W.	..	Ditto.
17	29.449	82.5	83.5	70.9	N. W.	..	Ditto.
18	29.467	81.9	82.7	70.5	N. W.	..	Ditto.
19	29.491	82.2	83.5	72.5	S.	..	∩ scattered in zen.
20	29.523	84.5	84.5	70.0	S.	..	Clear.
21	29.535	83.5	84.8	69.0	N. W.	..	Ditto.
22	29.619	83.0	83.5	69.5	N.	..	Ditto.
23	29.541	82.2	83.4	66.5	W.	..	Ditto.
24	29.455	81.9	82.4	68.0	S. W.	..	⌒ to East.
25	29.461	81.5	82.0	66.9	N. W.	..	Clear.
26	29.577	81.0	81.5	65.9	N. W.	..	Ditto.
27	29.517	81.2	82.0	65.6	W.	..	Ditto.
28	29.485	81.0	81.6	65.4	N. W.	..	Ditto.
29	29.579	74.5	74.2	67.5	E.	..	Ditto.
30	29.573	71.7	72.4	57.5	N. W.	..	Ditto.
31	29.595	74.0	74.5	57.0	W.	..	Ditto.
Mean.	29.484	82.8	83.5	69.0			

Barometer Observations corrected for Capillarity only.

Symbols.
- \ Cirus.
- ⌒ Cirro strata.
- ∩ Cumuli.
- ⌒ Cumulo strata.
- ⌒ Nimbi or Nimbus.

Note.—The dry bulb and maximum Register do not agree, the former always reads more than the latter. The average difference is 1.6.

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of October, 1855.

Observations at apparent Noon.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.363	92.0	92.0	75.9	N.	..	Clear.
2	29.395	90.7	91.5	73.5	N.	..	Ditto.
3	29.405	92.0	92.4	75.4	N. E.	..	Ditto.
4	29.355	92.9	93.2	73.5	N. W.	..	Ditto.
5	29.359	90.5	90.8	70.5	N. W.	..	Ditto.
6	29.429	88.5	89.2	70.0	W.	..	Ditto.
7	29.463	89.0	91.0	70.0	N. W.	..	∽ scattered in zen.
8	29.491	87.5	88.0	70.0	N. W.	..	Clear.
9	29.433	87.6	87.9	69.2	S. W.	..	Ditto.
10	29.439	89.0	89.9	68.5	N. W.	..	Ditto.
11	29.435	87.0	89.0	69.5	N. W.	..	Ditto.
12	29.415	90.0	90.5	74.0	S. W.	..	Ditto.
13	29.451	89.0	89.8	71.5	N.	..	Ditto.
14	29.427	85.2	85.7	70.0	..	..	Ditto.
15	29.459	87.5	88.0	71.0	W.	..	Ditto.
16	29.447	89.0	89.0	71.5	W.	..	Ditto.
17	29.439	88.0	89.4	72.5	N. W.	..	Ditto.
18	29.441	88.5	89.5	71.5	N. W.	..	Ditto.
19	29.455	88.5	89.4	70.5	S.	..	∩ scattered in zen.
20	29.485	87.2	87.5	71.0	S. W.	..	Clear.
21	29.505	86.4	87.0	69.5	N. W.	..	∩ scattered in zen.
22	29.583	86.0	86.5	69.0	N.	..	Clear.
23	29.493	87.5	87.9	67.4	N. W.	..	Scattered in zen.
24	29.415	87.2	87.9	66.5	W.	..	Scattered.
25	29.447	85.5	86.0	67.5	N. W.	..	Clear.
26	29.505	88.0	88.5	65.6	N. W.	..	Ditto.
27	29.467	88.6	89.5	65.8	N. W.	..	Ditto.
28	29.435	84.9	85.5	66.5	N. W.	..	∽ scattered.
29	29.527	78.5	78.4	68.0	N. E.	..	Clear.
30	29.547	78.8	78.5	57.5	N. W.	..	Ditto.
31	29.565	79.0	79.4	56.8	N. W.	..	Ditto.
Mean.	29.454	87.4	88.0	69.3			

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of October, 1855.

Minimum pressure observed at 4 P. M.

Date.	Barometer.	Temperature.			Maximum and Minimum.			Aspect of the Sky.	Direction of Wind.	Quantity of Rain.
		Of Mercury.	Of Air.	Wet Bulb.	Maximum.	Minimum.	Mean.			
1	29.313	96.0	95.5	73.4	96.0	76.0	86.0	Clear.	N. W.	..
2	29.355	96.0	95.0	76.0	95.5	76.0	85.75	Ditto. [zen.	N.	..
3	29.351	96.9	95.9	73.5	96.5	77.9	87.2	∩ scattered in	N. W.	..
4	29.309	95.5	94.9	73.0	95.5	75.0	85.25	Clear.	N. W.	..
5	29.305	94.8	93.9	72.4	94.0	73.0	83.5	Ditto.	W.	..
6	29.383	93.5	92.0	69.5	93.5	75.5	84.5	Ditto. [zen.	S. E.	..
7	29.453	93.7	93.5	73.1	93.5	74.0	83.75	∩ scattered in	N. W.	..
8	29.427	92 5	91.9	71.9	92.0	73.0	82.5	Clear.	N. W.	..
9	29.375	92.0	92.0	72.5	91.8	72.0	81.9	Ditto.	N. W.	..
10	29.387	93.0	92.8	70.5	93.0	71.5	82.25	Ditto.	N. W.	..
11	29.373	93.0	93.0	71.5	93.5	71.0	82.25	Ditto.	N. W.	..
12	29.353	94.5	94.0	75.5	94.3	72.0	83.15	Ditto.	N. W.	..
13	29.403	94.5	94.6	73.3	94.5	74.0	84.25	Ditto.	N.	..
14	29.373	91.5	91.4	71.0	92.5	72.5	82.5	Ditto.	N. W.	..
15	29.409	92.9	92.9	72.8	92.8	70.0	81.4	Ditto.	N. W.	..
16	29.375	93.0	92.8	72.4	92.8	72.0	82.4	Ditto.	N. W.	..
17	29.399	93.9	93.5	73.4	93.5	71.0	82.25	Ditto.	N. W.	..
18	29.397	92.8	91.5	67.5	92.0	69.0	80.5	Ditto. [zen.	N. W.	..
19	29.393	91.0	90.4	73.4	91.4	70.9	81.0	∩ scattered in	S. W.	..
20	29.429	90.6	89.5	71.8	91.0	70.5	80.75	Clear.	W.	..
21	29.473	90.4	90.6	72.0	90.5	70.5	80.5	Ditto.	N. W.	..
22	29.497	90.5	89.9	70.0	90.5	71.8	81.15	Ditto. [zen.	N. E.	..
23	29 405	90.2	89.5	67.3	90.0	70.	80.0	Scattered in	N. W.	..
24	29.355	91.5	91.0	67.9	91.0	68.5	79.75	∪ scattered.	N. W.	..
25	29.405	90.5	90.4	70.9	90.5	68.0	79.25	Clear.	N. W.	..
26	29.465	91.5	91.0	65.5	91.0	67.9	79.45	Ditto.	N. W.	..
27	29.403	91.0	90.5	67.5	91.5	68.2	79.85	∩ scattered.	N. W.	..
28	29.381	80.9	79-4	64.0	87.5	70.3	78.9	∿ to E.	N.	..
29	29.497	82.5	81.5	71.0	82.0	65.0	73.5	Clear.	N. E.	..
30	29.519	81.9	81.0	59.5	81.2	61.0	71.1	Ditto.	N. W.	..
31	29.527	83.0	82.0	59.7	83.0	63.5	73.25	Ditto.	W.	..
Mean.	29.403	91.4	90.9	70.4	91.5	71.0	81.28			

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of Nov. 1855.

Maximum pressure observed at 9.50 A. M.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.609	74.0	74.6	58.8	N. W.	..	Clear.
2	29.553	74 9	75.9	58.0	N. W.	..	Ditto.
3	29.555	74.0	75.0	59.5	N. E.	..	Ditto.
4	29.581	75 5	76.2	59.8	W.	..	Ditto.
5	29.605	75.0	75.9	62.5	N. W.	..	Ditto.
6	29.555	75.9	76.8	73 5	E.	..	Ditto.
7	29.527	78.2	79 0	64.4	S. W.	..	Ditto.
8	29.539	78 9	80.5	65.9	N. W.	..	Ditto.
9	29.511	77.0	77.0	60.5	N.	..	Ditto.
10	29.541	76.8	77.5	62.9	N. E.	..	Ditto.
11	29.583	76.0	76 9	62.4	N.	..	Ditto.
12	29.587	72 8	73.5	59.4	N. E.	..	Ditto.
13	29.565	72.5	74.4	61.5	N. W.	..	Ditto.
14	29.545	74.0	75.5	61.0	N. W.	..	Ditto.
15	29.549	74.5	75.2	64.5	S. W.	..	Ditto.
16	29.537	71.6	72.9	58.9	W.	..	Ditto.
17	29.555	70 8	72.0	59 3	S. W.	..	Ditto.
18	29.537	73.8	74.8	58.8	N. E.	..	Ditto.
19	29.513	71.0	72.2	60.0	W.	..	Ditto.
20	29.563	69.0	69.5	57.5	W.	..	Ditto.
21	29.645	69.9	71.0	54.9	S.	..	∽ scattered to S. East.
22	29.659	68.9	70.3	58.	S. W.	..	⌣ scattered in zen.
23	29.615	72.0	72.0	59 0	N. W.	..	Clear.
24	29.663	70.5	71.5	59.0	S. W.	..	Ditto.
25	29.667	69.0	70.4	57.0	W.	..	Ditto.
26	29.695	70.9	72.0	58.2	N. W.	..	⌣ scattered.
27	29.721	71.0	71.8	58.4	S. E.	..	Clear.
28	29.681	70.8	70.8	58.5	N. W.	..	Ditto.
29	29.715	67.5	68.5	55 0	N. W.	..	Ditto.
30	29.693	66.2	67.0	54.5	N. W.	..	Ditto.
	29.595	72.7	73.6	60.0			

Barometer Observations corrected for Capillarity only.

Symbols.
- \ Cirus.
- ⌣ Cirro strata.
- ∩ Cumuli.
- ∽ Cumulo strata.
- ≤ Nimbi or Nimbus.

Note.—The dry bulb and maximum Register do not agree, the former always reads more than the latter. The average difference is 1.0.

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of Nov. 1855.

Observations at apparent Noon.

Date.	Barometer.	Temperature.			Direction of Wind.	Quantity of Rain.	Aspect of the Sky.
		Of Mercury.	Of Air.	Wet Bulb.			
1	29.577	79.0	78.4	58.4	N. W.	..	Clear.
2	29.519	82.0	82.8	60.0	N. W.	..	Ditto.
3	29.531	81.9	83.0	61.0	N. W.	..	Ditto.
4	29.555	82.0	82.5	63.8	W.	..	Ditto.
5	29.577	80.0	81.2	63.5	N. E.	..	Ditto.
6	29.501	81.9	82.5	64.5	S. W.	..	Ditto.
7	29.505	84.8	85.8	64.5	W.	..	Ditto.
8	29.517	84.9	85.4	65.0	N. W.	..	\ scattered to West.
9	29.487	81.0	81.6	61.0	N. W.	..	Clear.
10	29.519	81.5	82.4	63.5	N. E.	..	Ditto.
11	29.557	80.7	81.3	63.5	N.	..	Ditto.
12	29.561	78.5	79.0	59.9	N.	..	Ditto.
13	29.516	78.9	79.8	61.0	N. W.	..	Ditto.
14	29.517	80.0	80.0	61.0	S. W.	..	Ditto.
15	29.521	81.0	82.0	63.0	W.	..	Ditto.
16	29.509	79.2	79.5	60.0	N. W.	..	Ditto.
17	29.517	78.0	78.5	59.5	S. W.	..	Ditto.
18	29.509	76.9	76.9	61.1	N. E.	..	Ditto.
19	29.499	76.5	78.0	59.0	W.	..	Ditto.
20	29.539	72.5	72.8	56.5	W.	..	Ditto.
21	29.629	74.0	74.7	55.5	S. W.	..	Ditto.
22	29.641	74.0	75.9	58.0	..	..	Ditto.
23	29.595	78.0	77.5	60.3	N. W.	..	Ditto.
24	29.629	76.0	77.5	59.6	S. W.	..	Ditto.
25	29.641	74.5	75.7	58.0	W.	..	Ditto.
26	29.667	74.0	74.2	59.3	S. W.	..	\— scattered.
27	29.705	75.9	76.0	60.5	S. E	..	Clear.
28	29.651	76.8	77.4	59.5	N. W.	..	Ditto.
29	29.677	71.5	71.2	57·2	N. W.	..	Ditto.
30	29.667	70.0	70.8	56.9	N. W.	..	Ditto.
	29.571	78.2	78.8	60.4			

Meteorological Register kept at the Office of the Secretary to Government, N. W. P., Agra, for the month of Nov. 1855.

Minimum pressure observed at 4 P. M.

Date.	Barometer.	Temperature.			Maximum and minimum.			Aspect of the Sky.	Direction of Wind.	Quantity of Rain.
		Of Mercury.	Of Air.	Wet Bulb.	Maximum.	Minimum.	Mean.			
1	29.509	84.5	83.5	61.9	83.5	62.5	73.0	Clear.	N. W.	..
2	29.489	87.0	86.0	63.0	86.5	61.5	74.0	Ditto.	N. W.	..
3	29.491	87.8	86.8	64.4	87.0	61.0	74.0	Ditto.	N. W.	..
4	29.513	88.0	87.5	65.0	88.0	61.5	74.75	Ditto.	W.	..
5	29.529	87.0	86.6	66.0	87.2	63.0	75.1	Ditto.	N. W.	..
6	29.459	88.0	87.5	67.5	88.0	63.5	75.75	Ditto.	S. W.	..
7	29.470	90.0	89.0	70.5	90.6	63.5	77.05	Ditto.	N. W.	..
8	29.467	89.0	88.8	67.9	89.0	65.0	77.0	\ scattered to [west.	N. W.	..
9	29.445	87.0	86.5	64.0	86.8	63.5	77.15	Clear.	N. W.	..
10	29.467	86.9	86.2	65.4	87.0	69.0	78.0	Ditto.	N. W.	..
11	29.519	85.8	85.5	64.4	86.0	63.5	74.75	Ditto.	N.	..
12	29.501	85.0	84.4	63.5	85.0	62.0	73.5	Ditto.	N.	..
13	29.467	84.0	84.0	63.8	84.2	61.8	73.0	Ditto.	N. W.	..
14	29.477	84.2	84.0	66.0	84.5	65.0	74 75	Ditto.	S. W.	..
15	29.471	86.9	86.6	63.0	87.0	62.0	74.5	Ditto.	W.	..
16	29.449	83.0	83.0	63.9	83.5	59.0	71.25	Ditto.	N. W.	..
17	29.481	82.0	81.5	62.6	82.0	57.0	69.5	Ditto.	N. W.	..
18	29.449	82.0	81.8	64.4	82.0	61.5	71.75	Ditto.	W.	..
19	29.461	81.5	81.0	61.8	81.5	58.5	70.0	Ditto.	N. W.	..
20	29.487	80.0	79.5	59.5	79.5	58.0	68.75	\— scattered.	N. W.	..
21	29.567	81.0	80.5	60.1	81.0	57.5	69.25	Clear.	W.	..
22	29.595	82.9	82.5	64.5	83.5	58.0	70.75	Ditto.	S. W.	..
23	29.539	83.5	82.5	62.5	83.5	61.5	72 5	Ditto.	N. W.	..
24	29.579	81.9	80.8	62.5	82.0	61.8	71.9	Ditto.	W.	..
25	29.615	80.0	79.5	61.2	79.5	57.5	68.5	Ditto.	N. W.	..
26	29.623	79.4	79.5	61.2	80.0	60.0	70.0	Ditto.	N. W.	..
27	29.637	80.2	80.0	63.5	80.0	60.0	70.0	..	S. E.	..
28	29.597	81.7	80.6	62.9	81.0	59.0	70.0	Clear.	N. W.	..
29	29.623	75.9	74.5	60.0	75.0	54.0	68.5	Ditto.	N. W.	..
30	29.627	75.6	74.8	59.4	75.3	52.5	63.8	Ditto.	N. W.	..
	29.520	83.7	83.1	63.5	83.6	60.8	72.22			

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1855.

Latitude 22° 33′ 1″ North, Longitude 88° 20′ 34″ East.

Height of the cistern of the Standard Barometer above the level of the Sea, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.624	29.693	29.531	0.162	84.9	91.0	80.7	10.3
2	*Sunday.*							
3	.630	.683	.551	.132	83.4	87.2	80.4	6 8
4	.638	.690	.576	.114	82.8	87.7	80.4	7.3
5	.639	.687	.575	.112	82.2	86.0	80.2	5.8
6	.595	.654	.523	.131	81.4	87.1	78.8	8.3
7	·595	.645	.532	.113	81.5	87.4	78.8	8.6
8	.643	.726	.570	.156	79.3	80.8	77.6	3.2
9	*Sunday.*							
10	.773	.833	.725	.108	80.4	83.6	79.0	4.6
11	.796	.856	.735	.121	81.1	85.6	78.8	6.8
12	.757	.821	.677	.144	82.8	87.6	78.6	9.0
13	.722	.771	.662	.109	81.9	84.6	80.2	4.4
14	.703	.751	.647	.104	81.3	85.1	79.2	5 9
15	.689	.748	.613	.135	82.2	88.5	79.2	9.3
16	*Sunday.*							
17	.580	.626	.509	.117	81.0	85.6	79.0	6.6
18	.534	.580	.477	.103	78.7	79.7	77.4	2.3
19	.574	.639	.540	.099	81.4	85.0	78.6	6.4
20	.594	.677	.539	.138	83.3	88.2	78.5	9.7
21	.690	.757	.631	.126	83.8	87.2	79.6	7.6
22	.748	.828	.689	.139	83.9	89.4	80.3	9.1
23	*Sunday.*							
24	.752	.807	.685	.122	83.5	89.0	80.2	8.8
25	.780	.851	.728	.123	83.8	88.1	80.4	7.7
26	.811	.868	.736	.132	83.9	89.8	80.2	9.6
27	.797	.862	.713	.149	84.0	90.4	80.4	10.0
28	.792	.847	.724	.123	82.8	89.6	79.4	10.2
29	.792	.852	.740	.112	82.1	85.6	80.0	5.6
30	*Sunday.*							

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1855.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	80.9	4.0	78.9	6.0	0.967	10.34	2.15	0.828
2	*Sunday.*							
3	80.3	3.1	78.7	4.7	.961	.31	1.65	.862
4	80.3	2.5	79.0	3.8	.970	.42	.33	.887
5	80.1	2.1	79.0	3.2	.970	.44	.10	.905
6	79.5	1.9	78.5	2.9	.955	.29	0.98	.913
7	79.3	2.2	78.2	3.3	.946	.19	1.12	.901
8	78.3	1.0	77.8	1.5	.934	.09	0.50	.953
9	*Sunday.*							
10	79.1	1.3	78.4	2.0	.952	.27	.67	.939
11	79.5	1.6	78.7	2.4	.961	.37	.80	.928
12	80.2	2.6	78.9	3.9	.967	.39	1.36	.884
13	80.0	1.9	79.0	2.9	.970	.44	.00	.913
14	79.3	2.0	78.3	3.0	.949	.22	.02	.909
15	80.0	2.2	78.9	3.3	.967	.41	.13	.902
16	*Sunday.*							
17	79.0	2.0	78.0	3.0	.940	.13	.01	.909
18	77.6	1.1	77.0	1.7	.910	9.85	0.56	.946
19	79.2	2.2	78.1	3.3	.943	10.16	1.11	.902
20	80.3	3.0	78.8	4.5	.964	.34	.59	.867
21	81.1	2.7	79.7	4.1	.992	.63	.47	.879
22	80.8	3.1	79.2	4.7	.976	.45	.68	.862
23	*Sunday.*							
24	79.9	3.6	78.1	5.4	.943	.12	.88	.843
25	80.2	3.6	78.4	5.4	.952	.21	.89	.844
26	80.0	3.9	78.0	5.9	.940	.07	2.06	.830
27	80.4	3.6	78.6	5.4	.958	.28	1.89	.845
28	80.0	2.8	78.6	4.2	.958	.30	.45	.877
29	79.7	2.4	78.5	3.6	.955	.27	.24	.892
30	*Sunday.*							

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1855.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.705	29.826	29.549	0.277	80.8	82.8	79.0	3.8
1	.693	.826	.545	.281	80.7	82.0	79.2	2.8
2	.681	.811	.536	.275	80.6	81.8	79.2	2.6
3	.673	.806	.511	.295	80.4	81.6	78.9	2.7
4	.667	.808	.507	.301	80.1	81.4	78.6	2.8
5	.679	.811	.517	.294	79.9	81.3	78.6	2.7
6	.694	.819	.526	.293	79.9	81.4	78.6	2.8
7	.713	.846	.547	.299	80.5	82.8	78.6	4.2
8	.734	.865	.554	.311	82.0	84.4	78.2	6.2
9	.742	.863	.564	.299	82.7	85.8	78.2	7.6
10	.742	.868	.571	.297	84.2	87.0	78.8	8.2
11	.732	.857	.566	.291	84.7	87.8	78.4	9.4
Noon.	.708	.831	.546	.285	85.3	89.0	78.9	10.1
1	.683	.803	.521	.282	85.4	89.8	78.0	11.8
2	.659	.772	.498	.274	85.9	91.0	78.0	13.0
3	.640	.747	.477	.270	85.1	91.0	78.2	12.8
4	.634	.751	.480	.271	84.1	90.4	78.4	12.0
5	.633	.758	.482	.276	83.1	88.2	77.4	10.8
6	.646	.761	.492	.269	82.3	86.3	78.0	8.3
7	.664	.782	.530	.252	81.9	84.3	79.0	5.3
8	.693	.803	.547	.256	81.6	83.8	79.0	4.8
9	.710	.823	.570	.253	81.3	83.6	79.2	4.4
10	.720	.829	.580	.249	81.1	83 4	77.6	5.8
11	.715	.834	.571	.263	80.8	83.0	77.7	5.3

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1855.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	79.4	1.4	78.7	2.1	0.961	10.37	0.70	0.937
1	79.5	1.2	78.9	1.8	.967	.43	.61	.945
2	79.4	1.2	78.8	1.8	.964	.40	.61	.945
3	79.2	1.2	78.6	1.8	.958	.34	.60	.945
4	79 0	1.1	78.4	1.7	.952	.27	.57	.947
5	78.9	1.0	78.4	1.5	.952	.27	.51	.953
6	78.9	1.0	78.4	1.5	.952	.27	.51	.953
7	79.3	1.2	78.7	1 8	.961	.37	.61	.944
8	79.8	2.2	78.7	3.3	.961	.35	1.12	.902
9	80.0	2.7	78.6	4.1	.958	.30	.42	.879
10	80.6	3.6	78.8	5.4	.964	.34	.90	.845
11	80.6	4.1	78.5	6.2	.955	.23	2.19	.824
Noon.	80.8	4.5	78.5	6.8	.955	.21	.43	.808
1	80.6	4.8	78.2	7.2	.946	.11	.57	.797
2	80.9	5.0	78.4	7.5	.952	.15	.72	.789
3	80.6	4.5	78.3	6.8	.949	.14	.43	.807
4	80.2	3.9	78.2	5.9	.946	.13	.08	.830
5	80.0	3.1	78.4	4.7	.952	.21	1.65	.861
6	79.7	2.6	78.4	3.9	.952	.23	.35	.884
7	79.7	2.2	78.6	3.3	.958	.32	.12	.902
8	79 6	2.0	78.6	3.0	.958	.32	.02	.910
9	79.5	1.8	78.6	2.7	.958	.32	0.92	.918
10	79.4	1.7	78.5	2.6	.955	.29	.88	.921
11	79.4	1.4	78.7	2.1	.961	.37	.70	.937

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1855.

Solar radiation, Weather, &c.

Date.	Max Solar radiation.	Rain.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	129.8	0.20	E. or S.	Cloudless till 5 A. M. scattered ⌒i till 8 P. M. cloudless afterwards.
2	*Sunday.*	..	..	
3	119.0	..	E. or S. E.	Various clouds till 7 P. M. cloudless afterwards, also drizzling at 1 A. M.
4	..	..	E. or E. S. E.	Cloudy. [and 1 P. M.
5	..	..	E. or S. E.	Cloudy with drizzling between 11 A. M.
6	..	0.20	E.	Cloudy and constantly raining.
7	..	0.80	E. or S. E.	Ditto.
8	..	4.29	E. or S. E.	Cloudy and raining the whole day.
9	*Sunday.*	2.61	..	
10	..	0.46	E.	Cloudy with little rain before sunrise.
11	..	1.46	E. S. E. or S. W.	Cloudy with rain between 3 and 5 P. M.
12	..	..	S. W. or N. E. or S.	Cloudless till 5 A. M. scattered ⌒i afterwards. [also at 11 A. M.
13	..	0.51	S. or E. or S. E.	Cloudy with rains before sunrise and
14	..	0.62	S. E. or W. or S.	Cloudy and raining between Midnight and 5 A. M. and also at 5 P. M.
15	..	0.59	Variably.	Cloudless till 5 A. M. cloudy afterwards, also raining at 2½ and 4 P. M.
16	*Sunday.*	0.28	..	
17	115.0	0.22	S. E. or N. or N. E.	Cloudy with rains between 4 and 5 P. M.
18	..	4.15	N. or N. W. or W.	Cloudy with rains the whole day.
19	..	1.36	N. E. or W.	Cloudy with much rain before sunrise.
20	..	0.28	W.	Cloudless till 3 A. M. Cloudy afterwards with little rain between 10 and 11 P.M.
21	108.0	..	W. or W. S. W.	Cloudy. [wards.
22	132.7	..	S. W. or W. or E.	Cloudless till 5 A. M. scattered ⌒i after-
23	*Sunday.*	..	..	[tween 3 and 4 P. M.
24	135.5	0.19	S. or N. E. or S. E.	Cloudy with a smart shower of rain be-
25	130.0	0.22	Calm or S. E. or S.S.E.	Scattered \i till 3 A. M. cloudless till 7 A. M. scattered ⌒i afterwards also rain between 2 and 3 P. M.
26	134.0	..	S. E. or S.	Scattered ⌒i.
27	136.7	0.47	S. or S. W. or S.	⌣i at horizon till 7 A. M. scattered ⌒i till 6 P. M. overcast afterwards with lightning and rain at 7 and 8 P. M.
28	145.0	0.22	S. or E.	Cloudy till 2 A. M. scattered \i and ⌣i till 11 A. M. cloudy afterwards with rain at 3 P. M.
29	..	..	N. E. or S. E.	Cloudy more or less the whole day with little drizzling at Noon.
30	*Sunday.*	0.26	..	

\i Cirri, ⌣i cirro strati, ⌒i cumuli, ⌢i cumulo strati, \⌣i nimbi, —i strati, \⌢ ; cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Latitude 22° 33′ 1″ North, Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Level of the Sea 18.11 feet.

Daily Means, &c. of the Observations, and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.757	29.803	29.708	0.095	81.2	88.7	78.0	10.7
2	.761	.818	.712	.106	80.9	86.2	78.4	7.8
3	.747	.802	.688	.114	80.9	85.0	78.4	6.6
4	.748	.806	.688	.118	83.7	89.1	79.2	9.9
5	.767	.829	.724	.105	84.5	90.4	80.2	10.2
6	.833	.893	.777	.116	84.2	90.2	79.8	10.4
7	*Sunday.*							
8	.857	.935	.797	.138	83.1	88.8	77.8	11.0
9	.816	.885	.755	.130	83.1	88.8	77.0	11.8
10	.802	.876	.765	.111	84.2	89.6	78.8	10.8
11	.801	.864	.749	.115	84.6	89.9	80.0	9.9
12	.805	.862	.756	.106	84.6	90.1	80.6	9·5
13	.850	.920	.811	.109	85.1	91.2	80.0	11.2
14	*Sunday.*							
15	.858	.925	.799	.126	84.5	90.2	80.0	10.2
16	.847	.930	.784	.146	83.0	88.2	79.4	8.8
17	.869	.931	.828	.103	79.3	85.0	76.2	8.8
18	.875	.945	.822	.123	78.8	84.6	75.8	8.8
19	.890	.942	.846	.096	78.6	84.0	76.4	7.6
20	.904	.963	.835	.128	80.4	86.0	75.8	10.2
21	*Sunday.*							
22	.956	30.031	.885	.146	81.3	88.4	78.0	10.4
23	.904	29.980	.813	.167	80.5	87.0	77.0	10.0
24	.868	.924	.804	.120	79.8	86.2	76.8	9.4
25	.892	.941	.832	.109	76.2	78.2	74.2	4.0
26	.901	.964	.846	.118	77.5	82.2	74.0	8.2
27	.879	.946	.822	.124	78.7	84.8	73.8	11.0
28	*Sunday.*							
29	.893	.968	.842	.126	78.6	85.4	72.9	12.5
30	.898	.955	.843	.112	79.1	85.8	73.0	12.8
31	.950	30.030	.904	.126	76.4	84.0	70.6	13.4

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	78.6	2.6	77.3	3.9	0.919	9.90	1.31	0.883
2	78.7	2.2	77.6	3.3	.928	10.01	.09	.902
3	78.6	2.3	77.4	3.5	.922	9.93	.17	.895
4	79.6	4.1	77.5	6.2	.925	.92	2.15	.822
5	80.0	4.5	77 7	6.8	.931	.96	.39	.806
6	79.5	4.7	77.1	7.1	.913	.78	.46	.799
7	*Sunday.*							
8	76.4	6.7	73.0	10.1	.801	8.58	3.28	.723
9	77.2	5.9	74.2	8.9	.832	.93	2.93	.753
10	78.4	5.8	75.5	8.7	.868	9.29	.95	.759
11	79.5	5.1	76.9	7.7	.908	.70	.69	.783
12	79.6	5.0	77.1	7.5	.913	.76	.63	.788
13	79.6	5.5	76.8	8.3	.905	.67	.90	.769
14	*Sunday.*							
15	79.8	4.7	77.4	7.1	.922	.87	.48	.799
16	79.0	4.0	77.0	6.0	.910	.77	.05	.827
17	76.8	2.5	75.5	3.8	.868	.38	1.21	.886
18	76.4	2.4	75.2	3.6	.860	.30	.14	.891
19	76.2	2.4	75.0	3 6	.854	.24	.14	.890
20	77.2	3.2	75.6	4.8	.871	.39	.55	.858
21	*Sunday.*							
22	78.3	3.0	76.8	4.5	.905	.73	.51	.866
23	77.5	3.0	76.0	4.5	.882	.50	.48	.865
24	77.1	2.7	75.7	4.1	.873	.43	.32	.877
25	74.9	1.3	74.2	2.0	.832	.05	0.61	.937
26	75.0	2.5	73.7	3.8	.819	8.89	1.15	.885
27	74.3	4.4	72.1	6.6	.778	.41	2.00	.808
28	*Sunday.*							
29	73.7	4.9	71.2	7.4	.756	.18	.20	.788
30	73.8	5.3	71.1	8.0	.753	.15	.38	.774
31	69.2	7.2	65.6	10.8	.630	6.85	.87	.705

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.851	29.971	29.752	0.219	79.0	83.6	74.8	8.8
1	.843	.961	.740	.221	78.5	83.2	74.2	9.0
2	.831	.956	.726	.230	78.3	82.6	73.4	9.2
3	.821	.947	.724	.223	78.4	82.4	72.5	9.9
4	.825	.946	.724	.222	77.9	82.2	72.0	10.2
5	.836	.961	.734	.227	77.6	81.8	71.2	10.6
6	.855	.975	.752	.223	77.5	81.8	70.6	11.2
7	.878	.999	.766	.233	78.3	82.6	71.0	11.6
8	.898	30.015	.783	.232	80.6	84.2	74.6	9.6
9	.912	·031	.802	.229	82.3	85.6	76.2	9.4
10	.910	.030	.800	.230	83.5	87.2	77.4	9.8
11	.894	.013	.787	.226	84.8	88.6	77.2	11.4
Noon.	.866	29.979	.756	.223	85.2	89.6	74.2	15.4
1	.838	.952	.727	.225	85.8	90.5	74.4	16.1
2	.816	.923	.708	.215	85.8	90.0	75.4	14.6
3	.800	.913	.688	.225	85.0	91.2	75.0	16.2
4	.799	.912	.688	.224	84.5	90.4	75.8	14.6
5	.806	.914	.690	.224	83.5	88.8	75.8	13.0
6	.814	.925	.700	.225	82.0	86.8	75.6	11.2
7	.833	.929	.720	.209	81.1	86 0	75.4	10.6
8	.853	.958	.748	.210	80.3	85.0	74.4	10.6
9	.865	.971	.767	.204	79.9	84.5	73.6	10 9
10	.866	.977	.767	.210	79.5	83.8	73.0	10.8
11	.860	.966	.761	.205	79.2	83.3	72.2	11.1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon. *(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	76.9	2.1	75.8	3.2	0.876	9.48	1.02	0.903
1	76 6	1.9	75.6	2.9	.871	.42	0.93	.910
2	76.6	1.7	75.7	2.6	.873	.45	.83	.919
3	76.6	1.8	75.7	2.7	.873	.45	.86	.917
4	76.3	1.6	75.5	2.4	.868	.42	.74	.927
5	76.1	1.6	75.3	2.4	.862	.36	.74	.927
6	76.0	1.5	75.2	2.3	.860	.33	.71	.929
7	76.4	1.9	75.4	2.9	.865	.37	.91	.911
8	77.3	3.3	75.6	5.0	.871	.39	1.62	.853
9	77.6	4.6	75.4	6.9	.865	.30	2.28	.803
10	77.8	5.7	74.9	8.6	.851	.11	.89	.759
11	78.2	6.6	74.9	9.9	.851	.09	3.37	.730
Noon.	78.2	7.0	74.7	10.5	.846	.03	.58	.716
1	78.4	7.4	74.7	11.1	.846	.03	.80	.704
2	78.2	7.6	74.4	11.4	.838	8.95	·88	.698
3	77.6	7.4	73.9	11.1	.824	.81	.72	.703
4	77.4	7.1	73.8	10.7	.822	.78	.57	.711
5	77.4	6.1	74.3	9.2	.835	.96	.04	.747
6	77.7	4.3	75.5	6.5	.868	9.33	2.14	.813
7	77.5	3.6	75.7	5.4	.873	.41	1.76	.842
8	77.4	2.9	75.9	4.4	.879	.49	.42	.870
9	77.1	2.8	75.7	4.2	.873	.43	.35	.875
10	77.0	2.5	75.7	3.8	.873	.43	.23	.885
11	76.9	2.3	75.7	3.5	.873	.43	.13	.893

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Solar radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	133.2	0.72	E. or N. E. or N.	Scattered ⌒i and _i till 7 A. M. only scattered _i till 11 A. M. cloudy afterwards with rain between 3 and 6 P. M.
2	130.6	..	N. E.	Scattered _i till 2 A. M. cloudless till 6 A. M. cloudy afterwards with drizzling after sunset.
3	..	0.09	N. E. or N.	Cloudy with little drizzling at 9 A. M.
4	145.0	..	S. E. or N. W. or W.	Cloudless till 3 A. M. more or less scattered ⌒i till 6 P. M. cloudless afterwards.
5	146.0	..	S. W. or W.	Cloudless till 6 A. M. clouds of various kinds till 6 P. M. cloudless afterwards.
6	141.0	..	Calm or W.	Cloudless till 3 A. M. scattered ⌒i till 6 P. M. cloudless afterwards.
7	*Sunday.*	..	..	
8	142.0	..	N.	Cloudless.
9	144.0	..	N. W.	Cloudless nearly the whole day.
10	144.0	..	N. W.	Ditto.
11	142.0	..	N. W.	Cloudless till 9 A. M. variable clouds till 7 P. M. cloudless afterwards.
12	139.0	..	N. W. or W.	Cloudless till 5 A. M. variable clouds till 5 P. M. cloudless afterwards.
13	145.0	..	W. or N. W. or N. E.	Cloudless till 10 A. M. scattered ⌒i till 6 P. M. cloudless afterwarda.
14	*Sunday.*	..	..	[wards,
15	136.0	..	S. or N.	Scattered ⌒i till 6 P. M. cloudless after-
16	138.0	..	N.	Cloudless till 3 A. M. scattered ⌒i till 3 P. M scattered _i and ⌒i afterwards.
17	..	0.16	N. N. E. or S.	Cloudless till 6 A. M. cloudy afterwards with rain between Noon and 4 P. M.
18	..	1.06	S. or E.	Cloudless till 6 A. M. cloudy afterwards with rain at 3 and 4 P. M.
19	..	..	N. or N. E. or S. W.	Cloudless till 4 A. M. cloudy afterwards with rain between 3 and 7 P. M.
20	118.0	0.38	W. or E. N. E.	Cloudy the whole day also drizzling between 7 and 9 P. M.

\i Cirri, _i Cirro-strati, ⌒i Cumuli, ⌒_i Cumulo-strati, _\i Nimbi, —i Strati, \\i Cirro-cumuli.

Abstract of the Result of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1855.

Solar radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
21	*Sunday.*	0.14	..	
22	140.0	..	S. or E. N. E. or W. or N.	Clouds of various kinds, also rain at 6 P. M.
23	134.0	..	S.	Cloudy more or less the whole day.
24	129.0	..	S.	Cloudy the whole day: also drizzling at 3 and 7 and 8 P. M.
25	..	0.83	N. E.	Cloudy, also drizzling between 7 A. M. and 3 P. M.
26	..	..	N.	Cloudy.
27	142.0	..	N. W. or N.	Variable clouds.
28	*Sunday.*	..	..	
29	142.0	..	N. W. or N.	Cloudless till 10 A. M. clouds of various kinds till 6 P. M. cloudless afterwards.
30	136.0	..	Calm or N. W. or W.	Cloudless nearly the whole day.
31	141.0	..	N. W. or N. or N. N. W.	Ditto.